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B. Coli Infection of Urinary Tract Complicating Pregnancy.*

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Bacteriology.

Although it is only a quarter of a century since Escherich first isolated the bacillus coli communis, separating it from the typhoid bacillus, with which it is morphologically identical, yet in that time no other bacterium has shown such a variable pathogenic history.

Found in large numbers in the human intestinal canal, and even in the stools of the newly-born, in association with perfect health, the B. coli was originally considered to be harmless. But from post mortem examinations its presence was detected in so many and so diverse situations that it became credited with being the causal factor in many diseases. Later, especially from the writings of Tavel and Lang, it was usual to look upon this bacillus as *non-pathogenic*, and now another change of opinion has developed, for at present the B. coli has come into vogue again, as the active factor in several pathological states.

In 1905 Dudgeon and Sargent, in their painstaking and convincing work, "The Bacteriology of Peritonitis," clearly demonstrated the pathogenic influence of the bacillus coli, and summarized its influence thus: "The B. coli plays the greatest part in hurrying our peritonitis cases from the wards to the post mortem room."

The bacillus is least virulent in the normal bowel, but in diseased conditions of the gut, or when the organism strays from the intestinal canal, it is prone to initiate a more or less virulent infection.

Whether we agree or do not with the view that has been suggested, namely, that the name bacillus coli communis is a generic title applicable to a number of different organisms, there is no doubting the fact that this organism exists in varying strains, as Dudgeon and Sargent, in an interesting observation, have shown. They isolated three strains from the peritoneal exudate of a case of ruptured typhoid ulcer, and found that two of them differed, both culturally and in their pathogenicity to guinea-pigs.

A point of some importance that must not be overlooked in

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considering the bacteriology of this disease is the not infrequent association of the bacillus coli complicating tuberculous lesions of the genito-urinary system.

Rutherford Morison has long held and taught that these cases of B. coli infection of the urinary tract, especially the chronic type, should be carefully examined and treated for the presence of a tuberculous infection.

Sidney Martin, in his Hunterian Lecture for 1909, describes the function of the B. coli in the intestine as being antagonistic to the putrefactive bacteria.

In the tissues the bacillus liberates an *endotoxin*, and in the urinary tract, should there be any degree of retention of urine, these endotoxins are absorbed into the system setting up such constitutional disturbances as have been already described, and, further, of exciting the formation of bactericidal and agglutinating substances, which are of considerable diagnostic value. For, although the blood is usually sterile, yet in urinary cases it will frequently agglutinate a strain of the bacillus taken from the fæces of the patient.

Pfaundler [1] concludes his observations on this subject with the assertion that there is no agglutinative action of the serum of a healthy individual from the presence of B. coli in the gut, but when the organism is present in the urinary passages then the agglutinative result is positive.

Fehling [2] reports a case of B. coli pyelonephritis with fever for 14 days ante-partum, and at delivery cultures from both the maternal and fœtal blood were sterile, but a fortnight after delivery the mother's blood diluted 1–150 agglutinated a B. coli isolated from the patient's urine.

This subject of serum agglutination of B. coli has been exhaustively reviewed by Coleman and Hastings. [3]

Albeck,[4] in 92 cases of pregnancy pyelitis, found the B. coli 76 times in pure culture.

Although the B. coli is the most frequent organism in genito-urinary infections, it is not the most serious, for, as pointed out by Albarran and others, both streptococcal and staphylococcal infections are much more lethal. The question as to the severity of cases of mixed infections of B. coli with other pyogenic organisms remains still unanswered; certainly one of the most severe cases that I have seen was one of a mixed infection.

Diagnosis.

Cases where the bladder symptoms are pronounced seldom fail to be recognized as they at once direct attention to the urinary

1. *Zentralb. f. Bacteriol.*, 1898, Bd. xxiii.
2. *Muench. m. Wochns.*, 1907, p. 1313.
3. *American Journ. of Med. Sciences*, Feb. 1909.
4. *Zeits. f. Geb. u. Gyn.*, 1907, Bd. lx.

system, but in cases where the disease attacks the upper urinary passages, namely, the ureter and renal pelvis (and these constitute the great majority of acute cases), the diagnosis is not quite so apparent, owing largely to a wrong interpretation of the symptoms complained of.

I attach considerable importance to the following points in the clinical picture:—

1. A rigor with sudden elevation of temperature occurring to a pregnant woman in apparent good health.
2. Sudden onset of acute abdominal pain, especially on the right side.
3. Attacks of "lumbago" during pregnancy.
4. Well-defined tenderness in the appendix area, but associated with a wide area of hyperæsthesia over the right renal neighbourhood.
5. Acute abdominal distention, sometimes so marked as to cause considerable respiratory embarrassment (and yet seldom described).
6. A *pregnancy cystitis* that persists in spite of the customary treatment.
7. Pyuria in pregnancy.

In the investigation of the complications of pregnancy how very frequently examination of the urinary system is either omitted altogether, or at least postponed until most of the other organs have been examined.

We are prone to consider the renal function only by way of second thought, or it may be because our treatment of such conditions in the past has been unavailing.

As a profession we have not yet clearly noticed the fact that the kidney function is not only of prime importance, but is *the one system* most likely to be called upon to bear the brunt of any pathological state complicating pregnancy. The usual cursory examination for the presence or absence of albumen is most inadequate; even microscopic and pathological examinations are not entirely satisfactory. In these days there can be no excuse, with the above-mentioned clinical features, for omitting cystoscopic examination and ureteral catherization, for such methods are essential to the completion of the diagnosis of "pregnancy pyelitis."

Differential Diagnosis.

The remarkable mimicry of this disease for many of the *intraperitoneal* sources of infection has already been indicated.

Brewer, in his paper on "Acute Unilateral Hæmatogenous Infections of the Kidney,"[1] reports eight cases, of which one was diagnosed as an acute cholecystitis, one as a perforating lesion of the colon and five as cases of acute appendicitis.

1. *Amer. Surg. Assoc.*, May 1908. *Surg. Obstet. and Gynæcol.*, 1908

1. *Appendicitis.* The seriousness of appendicitis as a complication of pregnancy is well recognized; it is associated with a high mortality, both for mother and child.

This is not so much due to any difference in the type of the disease from that occurring in the non-pregnant state, but rather to the fact that the symptoms are frequently interpreted as being due to the pregnancy, and are consequently ignored.

Murphy [1] puts the matter thus: "The association of the two conditions is serious, as the diagnosis is usually tardy, the operation late, inducing premature labour in the presence of sepsis." The pregnancy undoubtedly tends to aggravate any inflammatory condition that may be latent in the appendix.

Case I (V.S.) is a typical example of the difficulties in diagnosis. The sudden onset, with rigor, high temperature and rapid pulse, occasionally vomiting, muscular rigidity over the right lower quadrant of abdomen, tenderness over McBurney's point, and constipation are all clinical features applicable to both appendicitis with pregnancy and pregnancy pyelitis.

In two similar cases recently I saw the abdomen opened for appendicitis to show in each instance a healthy appendix; urinary examination afterwards, along with ureteral catheterization, revealed the true causation; they were examples of B. coli pyelitis.

Tenderness over McBurney's point should not be considered, as it often is, pathognomonic of appendicitis, for other interpretations are obtainable. The wide distribution of hyperæsthesia and muscle hyperalgesia over the right costo-vertebral area should always, in such cases, suggest complete examination of the urinary system, and appendicectomy should be deferred until this has been done.

C. B. Lockwood [2] has called attention to this subject, thus: "The resemblance to an attack of pelvic peritonitis caused by some such inflamed organ as the appendix is very close, because the patients will, in a serious and acute degree of coli bacillus cystitis, suffer considerably from *abdominal distention* and flatulence, high temperature with rigor, intense abdominal pain, increased frequency and painful micturition."

Some time ago I was asked by a medical man to see his wife, whom he suspected as suffering from right tubal pregnancy. She was a multipara, aged 31, and was then pregnant *in utero* four months. The onset of pain over the right lower quadrant was sudden, accompanied by frequency of micturition, and temperature 101·6°F.

On careful bimanual examination I excluded any tubal mischief, although there was tenderness over the roof of the vagina on the right side; abdominally, there was considerable pain and tenderness

1. *Keen's Surgery*, Vol. iv, p. 766.
2. *Clinical Journal*, Nov. 13 1907.

complained of over the appendix region; rectal examination was negative.

In view of the associated pregnancy I advocated the removal of her appendix; this was done, but the organ was found to be quite healthy.

The right ureter was noted to be much dilated, but there was no trace of any calculus.

On the following day urinary examination, which had previously been omitted, revealed the presence of a considerable quantity of pus. The bacteriological report was that the B. coli was present in pure culture, together with numerous epithelial cells.

This case impressed upon me the absolute necessity of a careful urinary examination and ureteral catheterization before considering the appendix operation in a pregnant woman.

" In one month," says Clarence Webster,[1] " I saw in consultation four cases of pregnant women in which operation for appendicitis had been recommended, when only right-sided pyeloureteritis existed. In each of these cases vaginal examination revealed a tender right ureter."

2. *Acute intestinal obstruction.* The sudden onset of acute abdominal pain with distention and vomiting, occurring in the midst of good health, is not by any means unlike an obstructive lesion of the gut.

One case related to me by a surgical colleague was that of a woman eight months pregnant with marked abdominal distention and pain. He opened the abdomen on the diagnosis of intestinal obstruction, but failed to find any lesion. At the post mortem examination the only discoverable lesion was a bilateral pyelitis.

Mackenzie,[2] in referring to abdominal distention as a reflex symptom of renal pelvis lesion, quotes the following interesting case: " I was summoned to do a laparatomy for obstruction of the bowel. When I saw the patient the symptoms certainly pointed to an obstruction of the bowel, for no fæces or flatus had passed for two days, the *abdomen was greatly distended* and all the muscles firm and rigid. I had much difficulty in passing my finger through the anus on account of the firm contraction of the sphincter. . . . While puzzling over the case I insisted on the patient placing her hand on the site of the spasm when it started and on following its course when it radiated. The region thus indicated was perfectly typical of the pain of renal colic . . . . that I unhesitatingly said that the patient had a renal calculus, and that the abdominal distention was due to the unyielding contraction of the sphincters. After two days the patient passed a small calculus."

1. Clarence Webster. "Mistakes in Diagnosis." *Surg. Obstet. and Gynæcol.*, April 1910.

2. "Symptoms and their Interpretation." Jas. Mackenzie, p. 180.

Lockwood has drawn attention to the presence of considerable abdominal distention, sometimes complicating B. coli cystitis; but, in the writer's experience, this symptom has been more frequently present, and even to a greater extent, in cases where the infection has attacked the higher reaches of the urinary tract.

3. Other *intra-peritoneal* infections may be closely imitated by this disease, and an important one is that of the biliary apparatus, *e.g.*, acute cholecystitis. This mistake in diagnosis is easily made, especially in the cases of pyelitis associated with jaundice; but, fortunately, such cases are not very common, apart from the uro-septicæmic type, where the B. coli is readily detected in the blood stream and the seeds of infection are widely scattered.

A mistake that can, as I know, occur, is when draining the gall-bladder in a case of B. coli cholecystitis, to overlook the pyelitis that may be masked by the biliary symptoms.

It is not without interest in this connection to note the observation which has frequently been made, namely, that the cases of acute cholecystitis which complicate typhoid fever and influenza are often due to the bacillus coli communis.

4. *Malaria.* Batty Shaw,[1] in a most interesting lecture, reports several cases, although not associated with pregnancy, which well illustrate the difficulties in diagnosis. These cases of B. coli pyelitis were sent into hospital, diagnosed as malaria, because of the sudden onset, the rigors and the intermittent temperature, but the characteristic parasite was not detected in the blood.

5. *Pneumonia and Pleurisy.* Case II. (v. supra), shows the resemblance to *pleurisy of the right side.* Of one of his published cases Stoeckel [2] says: "She had been having treatment for a right-sided pleuritis, and was sent into hospital on suspicion of an acute general infection. Illness began four weeks previously with *rigors, pain on the right side and cough;* improvement after fourteen days, and then sudden recurrence of rigor, fever, pain and cough, but no bladder symptoms."

This error in diagnosis is certainly excusable when one recalls the close topographical proximity of the two organs and their innervation.

Box,[3] in writing of the B. coli infections of the urinary tract in children, points out the liability to mistake pyelitis for pneumonia.

Trosseau's famous aphorism, "whenever an infant complains of pain in the abdomen, carefully examine the chest," occasionally requires to be inverted when applied to the adult, for the diagnostic features of pyelitis, sudden onset, with rigor, the acute costo-vertebral pain, high temperature and pulse, may readily be mistaken

1. *Clinical Journal,* Feb. 12 1908.
2. *Zeits. f. Gyn. Urologie,* Heft i, p. 44.
3. *Lancet,* Jan. 11 1908.

for an acute pneumonia where the consolidation has not yet so far advanced to the surface as to give the characteristic physical signs.

6. *Renal and Ureter Stone.* The sudden onset, the severity of the pain, its distribution downwards, the renal area—tenderness and vomiting, occasionally present a striking resemblance to the pain accompanying the passage of a renal calculus. The passage of a renal calculus may not only be simulated by a B. coli pyelitis, but by lowering the local resistance the calculus becomes a predisposing factor to pyogenic infection, and this is all the more likely when pregnancy is present.

Recently I saw in consultation the following case:—

Mrs. J., aged 34, quintipara, pregnant six months; previous health good, even since pregnancy commenced. In the midst of household duties she was suddenly seized with very severe pain over her left side, "catching her breath." She was unable to lie down owing to the pain.

Her doctor reported temperature 103°F., pulse 110, and the examination of the urine and chest to be negative. She vomited frequently, and felt sick after everything she took.

On physical examination the *abdomen was distended* much beyond the normal six months' size, but, owing to the rigidity and the wide area of tenderness, it was not possible to palpate the left kidney.

Vaginal and rectal examination negative.

The treatment adopted previous to my seeing her was the application of heat and a hypodermic of morphia for the agonizing pain. I suggested the advisability of rupturing the membranes to allow the pregnant uterus to descend from the kidney area, and this with the consent of the patient, was easily accomplished, the result being almost instantaneous relief from her pain and sickness.

Some six hours afterwards the patient delivered herself of a dead fœtus.

On the following day urinary examination showed a fair quantity of pus, and now the left kidney, although the overlying muscles were still very tender was readily palpable and found to be much enlarged.

The puerperium was normal until the 14th day, when the pain in the kidney region returned and the temperature rose to 102°F.

It was now deemed advisable to remove the patient to hospital to have the left kidney exposed by operation, and this was done, the functional capacity of the opposite kidney having been previously estimated.

The left kidney was removed, and proved to be the seat of a large pyonephrosis, confaining B. coli pus and some six or eight calculi.

Recovery was uninterrupted.

Etiology.

Of the many aspects of this disease there is none more interesting, and at the same time so complex and obscure as that of causation.

The problems that suggest themselves for solution under this heading are these:—

1. How does the bacillus gain access to the urinary passages?
2. The relatioinship between retention of urine and infection.
3. The marked frequency of the infection on the right side.
4. The influence of the pregnant uterus as a causal factor.

How the Bacillus gains Access to the Urine.

Many varying hypotheses have been propounded for the solution of this question, but we are able to recognize among the different authorities two opposing ideas:

(*a*) Those in favour of an ascending or urogenous infection.

(*b*) Those who support the descending or hæmatogenous view.

There is much to be said in support of both views, and doubtless the truth will be found in the statement that both are at times correct.

The older theory, that of the infection through the blood, is strongly supported by the majority of French observers, who state that there is a "wandering through" the intestinal wall from some lesion of its mucosa, and that thus the bacilli gain access to the lymph or blood streams, and are finally excreted by the kidney.

Such intestinal lesion must be of frequent occurrence, and we would, therefore, if this view is correct, expect a pyelitis, or at least a bacilluria, to be very frequently observed.

The late Professor Hamilton, in a report to the Board of Agriculture of his work on the intestinal infections of the sheep, stated that at certain seasons of the year some of the tetanoid group of bacilli were able to migrate through the intestinal wall, to gain access to the peritoneal fluid and thereafter to produce certain diseases, whereas at other seasons, similar organisms could be injected into the circulation of the sheep with negative results.

The conclusions he arrived at were that at certain seasons of the year there was either an increased virulence of the bacillus or there was a lowered resistance on the part of the body tissues.

This idea is suggestive, but I am unacquainted with any seasonal incidence having been noted in B. coli pyelitis cases.

The hæmatogenous mode of invasion is also supported by the fact that many of the infectious diseases, *e.g.*, measles, scarlet fever, follicular tonsillitis, diphtheria, etc., are not infrequently complicated by a pyelitis. In typhoid fever, too, the bacilli invade the urine and are detected most frequently in the declining stage of the disease, especially when the temperature reaches normal, *i.e.*, when the organism disappears from the blood. The generally accepted

explanation accounting for the number and persistence of the bacilli, is that the urine, having become infected by a few organisms, acts as a culture medium.

French,[1] in his Goulstonian lecture in 1908, expresses himself in favour of a descending infection, and supports his opinion by the statement that prior to the pregnancy there is no urinary complaint, and, further, that in a large number of cases of pregnancy pyelitis there is no cystitis present.

But the absence of previous urinary complaint is quite compatible with a history of bacilluria. At present I know a patient who, since her last pregnancy, two years ago, has suffered from intermittent attacks of headache and sickness with temperature—influenza attacks they have been called, but all the while there is a well-marked colon bacilluria, though without any symptoms referable to the urinary system.

Neither should much support be gathered from the comparative infrequency of cystitis in pregnancy pyelitis, for this fact is capable of another interpretation. The normal resistance of the bladder to infection is known to be very great, and organisms may be abundantly present in the vesical urine without setting up a cystitis yet capable of infecting the higher urinary field.

Lockwood[2] remarking on his acute cases of B. coli cystitis, mentions that the majority of them gave a history of some preceding illness which was usually labelled "influenza," "but whatever may be said about the antecedent cause, there is no question but that the colon bacillus *descends from the kidney*. There is abundant evidence to prove that pyogenic bacteria and intestinal bacteria, especially the typhoid bacillus, can pass through the kidney down the ureter and affect the bladder. Why they affect one bladder and not another I cannot say, but some of these acute cases occur in men who have had some obstruction to the exit of urine—stricture or enlarged prostate. . . . Colon cystitis is not rare after rectal operations; the organism may have entered per urethram, but it is also likely that it may have entered the general circulation from the wound and thus out by the kidneys."

Urogenous or Ascending Infection.

This is the newer view, and has considerably the greater number of authorities supporting it (Opitz,[3] Stoeckel, Albeck, etc.). Cystitis is a more frequent affection in women than in men, and this is attributed to the short urethra and the periodic hyperæmia of the pelvic organs at the menstrual periods.

The anatomical factor in causation has likewise to be borne in

1. *British Med. Journ.*, May 1908.
2. *Clinical Journal*, Nov. 13 1907.
3. *Zeits. f. Geb. u. Gyn.*, 1905, Bd. lv.

mind as an explanation of the fact that when this disease occurs in children two-thirds of the number are females.

Shober [1] quotes from the *Zentralb. f. Gyn.*, 1886, certain experiments on animals which demonstrated that the intact bladder mucosa is non-absorbent and has a peculiar power of resisting injury and the action of pathogenic organisms. From this it has been deduced that cystitis due to presence of micro-organisms alone is unknown, and that it always results from traumatism with the infection of organisms superadded.

Such traumatisms of the vesical mucosa, he says, may result from over-distention with urine, from the descent of the gravid uterus in early pregnancy, from the pressure of the fœtal head in parturition, and from the pressure of ill-fitting pessaries.

Albarran has produced cystitis by injecting B. coli after causing hyperæmia of the bladder from ligation of the urethra.

An ascending infection may reach the renal pelvis by the lumen or by the wall of the ureter, either in the regurgitant mucus stream, described by Bond, or by the ureteral plexus of blood-vessels or the abundant lymphatics which run in the periureteral sheath.

Rose Bradford [2] quotes Melchior, who found pathogenic organisms in the urethra in 50 per cent. of all cases examined, even when there was no history of instrumentation.

The Relationship between Retention of Urine and Infection.

One of the most generally accepted facts in urology is that retention of urine is a potent predisposing factor in the causation of cystitis. Stagnant urine becomes a favourable medium for the growth of bacteria by whatever route they may have gained access.

A similar retention of urine within the ureter or pelvis of the kidney is generally regarded as the initial stage to infection.

Stoeckel has verified the existence of such retention in several pregnant patients, whose sole complaint was backache or "lumbago," by the passing of a ureteral catheter and drawing off pent up urine which on examination proved to be sterile.

The great majority of observers have unhesitatingly accepted this idea of retention as a precursor of infection, the only difference amongst them being as to whether the superadded infection comes from above or from blow.

Albeck,[3] who has had considerable experience of this disease, maintains that in a considerable number of cases there is a preliminary bacilluria, and that the *retention is secondary*, and there is much to be said in support of his contention.

In one of my cases there was the history of apparently complete recovery from an attack of cystitis some twelve months prior to the

1. *Annals of Surgery*, June 1909.
2. *Progressive Medicine*, Vol. iv, 1908.
3. *Zeits. f. Geb. u. Gyn.*, 1907, Bd. lx, Heft 3.

pregnancy, and in the case of another patient, already referred to, there is at present a coli bacilluria, so that were retention to occur she would doubtless develop the characteristic picture of the disease.

As to the causation of retention of urine in the ureter in cases of pregnancy the commonly accepted explanation is the pressure of the pregnant uterus.

The anatomy of the ureter shows three narrow sites—one at its commencement, another at its termination in the bladder wall, and the third where it crosses the pelvic brim. This last site is selected as the place where the pregnant uterus is stated to compress the ureter so as to cause retention. But there are serious obstacles to overcome before such a plausible view can be accepted.

It ought to be of frequent occurrence in cases of pelvic deformity, but in only one case of "justo-minor" pelvis with pregnancy have I met with the complication of pyelitis, and one would expect this disease to be much more frequent than it is, and likewise expect it to complicate the patients' succeeding pregnancies.

Charles Reed,[1] in a paper to the Chicago Surgical Society, clearly sets forth many of the objections to the view that the pregnant uterus is the cause of retention. Every gynæcologist realises how delicate the vascular anastomosis of the ureter is, and Reed points out that any pressure sufficient to cause dilatation and retention in the ureter above would seriously jeopardize its vitality and lead to the formation of ureteral fistula.

This disease is also not recognized as a frequent complication of pelvic fibroids, as one would expect in the pressure view. Again, some observers, enamoured of the mechanical theory of obstruction, suggest that the ureteral mucosa, being continuous with that of the bladder, takes part in the general hyperæmia and hypertrophy of all the pelvic organs in the pregnant state, and that such hypertrophy would constitute an obstruction to the flow of urine from the ureter.

But the most insurmountable objection to all this is the fact that B. coli pyelitis occurs *in the non-pregnant state, in children and also in men*, so that if retention be a requisite stage in the causation of the disease then some causal factors other than the pressure of the pregnant uterus or the hypertrophied vesical mucosa associated with it must be proved.

It seems to me that before we can supply these absent links in the etiological chain further experimental work will have to be undertaken to supply evidence mainly in two directions:

1. As to the deleterious influence on the mucosa of the urinary tract by the excretion from the kidney of toxic substances at present unrecognized.

2. Whether in these cases of pyelitis the B. coli is of a specially virulent strain.

1. *Surg. Obst. and Gynæcol.*, 1907.

The remaining factor to be discussed under causation concerns the *marked unilateral frequency of the disease*, especially affecting the right side.

Albeck reports on 52 cases of B. coli pyelitis, and of these *31 were on the right side*, 9 were on the left and in 12 cases it was bilateral.

Lenhartz [1] reviews a series of 77 cases of pyelitis complicating pregnancy admitted to the Eppendorf Hospital at Hamburg. B. coli was found in pure culture in 66 cases; it was unilateral and on the *right side in 36 cases*, on the left in 17 and bilateral in 24.

With one exception all of my cases have been affected on *the right side*, and only when the disease has been advanced has the left been implicated.

To account for this marked unilateral frequency it is generally submitted that, although the pregnant uterus presses on both ureters, it does so more especially on the right one, owing to the uterus developing more on that side and undergoing a vertical axial rotation to the right.

But though the objections already mentioned to the part played by the pregnant uterus as a mechanical factor in the production of the retention of urine, are valid here also, yet mere coincidence cannot be accepted in explanation of the marked preponderance of the lesion on the right side.

Mirabeau [1] (Sigmund) suggests the interesting hypothesis that the proximity of the ascending colon to the kidney may permit of the direct transmission of bacteria viâ the lymphatics from the colon to the kidney, and especially if the latter be at all mobile, with occasional kinking of its ureter.

Treatment.

General. Rest in bed, attention to the bowels, bland diet and diluent drinks, will readily procure relief in the mildest cases, but the acute type of case calls for more vigorous treatment.

Medicinal. The most efficient drugs in the treatment of this complaint are the alkalies. The citrates and acetates of potassium or sodium, when given in *large doses* (grs. 30–40 every 3 hours), frequently exert a distinct control over the disease, and in several of my cases I have been surprised at the rapid subsidence of the most acute symptoms of B. coli pyelitis, when those alkalies have been pushed. The rigors ceased, the temperature and the abdominal pain quickly subsided and the urine increased in quantity.

Even in chronic cases the administration of these salts produces a marked diminution of the bacilluria. I am so far unable to explain the rationale of their action, for, theoretically one would expect that these alkalies, by lessening the acidity of the urine, would aggravate

1. *Muen. m. Wochns.*, 1907, No. 16.

the condition since we know that the bacillus coli, like other bacteria, tends to thrive better in alkaline or neutral media.

Holt and John Thomson, from their considerable experience of B. coli urinary infection in children, agree in giving great credit to the administration of the alkalies.

Urotropin, although much praised by several writers on this condition, has, in my experience, been so disappointing that I have come to the conclusion that neither this drug nor its ally *helmitol*, which liberates more of the formaldehyde, have much effect on pyelitis *when the infection is due to a pure culture* of the bacillus coli.

On the other hand, when the infection is a mixed one, as with streptococci or staphylococci, these drugs are of distinct value, and ought to be freely used.

Some authorities have a preference for the benzoate of sodium, boric acid or salol, but I have found none of these drugs so satisfactory as the citrates and acetates.

Specific treatment. The serum treatment has, so far, not produced very satisfactory results. This is not at all surprising when we realise that it is claimed by many bacteriologists that the B. coli shows no tendency to develop an anti-toxin, whereas proof has been freely brought forward in support of the efficacy of vaccination as a line of treatment, especially when the vaccine is autogenous.

Such a vaccine, prepared from one of my cases, where the organism was reported present in pure culture in the urine, and where the case altogether presented very typical features, gave only a disappointing result.

The vaccine, although in some cases it may not cure, will in other cases greatly ameliorate the symptoms.

Rovsing,[1] in a recently published account of 12 cases of B. coli pyelitis treated with vaccine, prepared according to Wright's directions, expresses his surprise at the very valuable results he obtained, especially in cases where other treatments had failed.

A recent line of treatment for which its advocates claim excellent results is douching the kidney pelvis with an antiseptic through the ureteral catheter.

Kelly and Casper[2] recommend this procedure, and Stoeckel is even more enthusaistic in his advocacy of it. He thus describes his method:—

"This method of treatment is almost unknown, and is considered dangerous and complicated, but this is not so. I force the catheter gradually as far as the renal pelvis and receive the flowing urine into a glass; then I connect the pavilion of the catheter by means of a

1. *Journ. Amer. Med. Assoc.*, July 24 1909.
2. *Kelly's Operative Gynæcology*, Vol. i.

gum elastic tube, with a very easily worked 50 cm. capacity syringe, whose contents I pass up very gradually and with equable pressure into the pelvis of the kidney.

The fluid returns to the bladder alongside the catheter, if the catheter is thin and the ureter lumen not quite filled up. After removing the syringe a portion of the infected fluid runs out of the catheter into a glass and is again tested; a 1 per cent. of silver nitrate is the fluid I most commonly use."

A very exhaustive account of lavage of the renal pelvis and ureter has recently been published by Garceau.[1]

Operative treatment. To obtain the necessary amount of drainage we have the option of two alternatives:—

1. *Nephrotomy*, producing a renal fistula on the loin.

2. Interrupting the pregnancy and emptying the uterus, thus restoring drainage by the normal passage, the ureter.

Regarding the interruption of the pregnancy, I admit to having previously had considerable trepidation, dreading the risk of septic uterine complications; but from more recent experience I now consider such hesitancy to be groundless.

Case III. (V.S.), where, in agreement with the general trend of obstetric teaching I demurred to emptying the uterus and producing a raw surface in the presence of such acute urinary infection, but the amazingly rapid subsidence of all the acute symptoms immediately following abortion so impressed me that in future I would have no hesitation in recommending the interruption of gestation *in very severe cases where the ordinary palliative treatment has been unavailing* rather than submit the patient to a nephrotomy.

1. *Journ. Amer. Med. Assoc.*, Jan. 23 1909.

The Pelvic Floor Aperture:

WITH AN APPENDIX.

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The Pelvic Floor Aperture.

On a former occasion I brought forward evidence to show that, whatever the position of the individual or the movement momentarily in progress, the pelvic floor musculature is the essential element concerned in the support of the pelvic viscera.[20] It were easy to understand that the pelvic floor could efficiently perform this task were it an exactly fitting and complete obturator; since, however, a deficiency, small but still of no mean proportions, exists in its structure, the problem to be solved is: How is retention of that part of the visceral mass which abuts upon the deficiency, that is, the lower part of the anterior vaginal wall and base of bladder, effected?

The deficiency in the pelvic floor may be spoken of as its "aperture." It is placed in the median line and in the anterior part of the floor. It is somewhat triangular or longitudinally oval in shape (Halban and Tandler[8]). Its base is in front, and is formed by the median aspect of the pubic arch and subpubic ligament; whilst the sides, which converge posteriorly, are formed by the median borders of the bilateral levator ani muscles. With the woman standing erect, the aperture is placed in the horizontal plane, or it slopes slightly upwards from before backwards,* a condition which depends upon the inclination of the pelvis. Halban and Tandler have called this aperture the "Levatorspalt," *i.e.*, the cleft in the levator.

The individual parts of the two levator ani muscles partaking in the formation of the boundaries of the pelvic floor aperture are of especial importance, and, according as we view the aperture from above (intra-pelvic), or from below (extra-pelvic), essential differences will be found. The most median and anterior part of the levator ani muscle consists of two laminæ, one placed above the other, both of which arise from the region of the pubes, lateral to the symphysis.†

* "*i.e.*, approximately, from the inferior margin of the symphysis backwards to below the perineal curvature of the rectum." (Halban and Tandler, *ibid*).

† Prof. P. Thompson says: "From the symphysis" (31, p. 80).

The superior lamina (pubo-coccygeus) of each side passes backwards and inwards; and each unites with the other behind the rectum, to be inserted, either by a forked aponeurosis into the last sacral vertebra (P. Thomson [31]), or simply into the ano-coccygeal ligament (Piersol [24]), towards which they converge. They are thus slung in a strap-like or hammock fashion, between the pubes in front and the sacrum or coccyx behind; thus, when their tonic contraction is augmented, they will offer an increased resistance upwards, preventing a descent, or indeed causing an elevation of the viscera. They are indeed admirably adapted for the support of the superimposed structures (P. Thomson [31]). Such increased contraction, on the other hand, will have little effect on the antero-posterior diameter of the pelvic floor aperture, the upper part of which they limit. It can only do this by raising the pelvic floor and thus causing, indirectly, such diminution; but since the excursion of the pelvic floor in health is by no means great (Herman [11]) such alterations will be correspondingly small. If, on account of such activity, an increased contraction result in a shortening of the muscle on each side—by no means an invariable concomitant—the transverse diameter of the aperture may be lessened by the bulging inwards of the muscle belly which results from such shortening (Hildebrandt [14]). Such bulging, however, occurs in all directions, and such diminution of the aperture transversely must be small and insignificant. In the lower animals, however, *e.g.*, in the dog, the increased contraction of the pubo-coccygei, which are disposed similarly to those in man, cause a closure of the slit which they limit, and through which the rectum and uro-genital passages pass; for their insertion into the tail is fixed by the extensors of that organ, and since the fibres bordering the slit are attached medianly below (pubic symphysis), and also medianly above (ventral mid-line of tail), their contraction will cause them to approach the median line—their fibres, instead of running circuitously around the rectum and vagina, will tend to run less circuitously—and this happening simultaneously on each side, will cause a bilateral compression of the rectum (and vagina), and indeed its occlusion. And Mr. Harrison Cripps [5] is of the opinion that a similar bilateral compression of the rectum occurs in man. He says (*ibid*): "... it will become obvious what must be the action of the levatores ani when they both contract simultaneously. So far as the coccyx is movable, they will tend to draw that bone upwards towards the symphysis, but, since in most bodies the coccyx scarcely moves, they will act powerfully as compressors of the rectum, squeezing the sides of the canal together as it passes between their two inner surfaces. In fact, when contracted, owing to their insertion near the middle line, they assume a shape like the letter V, the arms of which only diverge about one inch from each other at their attachments to the symphysis." Since, however, the attach-

ment to the pubic bones in man is usually not median, and, moreover, since there is no muscular mechanism in him capable of causing extension and thus rigidity of the coccyx—the extensors, when present, being very rudimentary—it seems this bilateral compression certainly cannot occur to anything like the same extent as in the lower animals; and although, when the coccyx is fixed by an increased visceral down-thrust, the bilateral contraction of the pubo-coccygei may possibly effect some such lateral compression of the rectum and vagina, this does not seem to be sufficient to efficiently guard the aperture and prevent escape of the viscera.

Very different, however, are the attachments of the other lamina of the muscle (pubo-rectalis), which is situated in a plane inferior to that of the pubo-coccygei we have just considered. This also arises from the pubes, passes backwards on each side, lateral to the vagina, and sweeping around the rectum, unites with its fellow of the opposite side immediately behind the gut.* This muscle, because it arises from the pubic bones and encircles the rectum, is called the pubo-rectalis. Of utmost significance is the anatomical fact that it is neither connected with the vertebral column by means of an aponeurosis nor to the ano-coccygeal ligament; even the union of the muscle of one side with that of the other behind the rectum, according to Luschka,[18] Henle,[9] Schatz,[27] and others, and which my own dissections confirm, unlike the rest of the pelvic floor musculature, is effected without the intervention of fibrous tissue, the fibres of the muscle of one side being directly continuous with those of the other. Thus the fibres arising from the pubis of one side, passing around the rectum posteriorly and returning to the pubis of the other side, may be considered as a single entity.

This freedom from the vertebral column allows the advance, provided the contents of the aperture permit it, of the posterior commissure of this muscle (*i.e.*, the part of the muscle passing from one side to the other behind the rectum) towards the symphysis when the muscle contracts; the muscle is, therefore, capable of causing considerable pressure to bear upon the structures placed between its posterior commissure and the symphysis, *i.e.*, upon the contents of the pelvic floor aperture, thus causing their occlusion and preventing an escape of whatever may be within the pelvis (*e.g.*, pessary) to without. If a diminution of these contents can occur, and a shortening of the muscle takes place, a lateral bulging of the muscle is also produced, and the transverse diameter of the pelvic floor

* Some of the anterior fibres of the pubo-rectalis pass to the side wall of the rectum (anal canal), insinuating themselves between the internal and external sphincters, whilst others join the longitudinal musculature of the gut (Kalischer). These, compared with the main mass of the pubo-rectalis, are relatively insignificant, and in the specimen I dissected, like the insignificant pre-rectal fibres, resembled connective-tissue rather than striated muscle.

aperture is encroached upon; but this can usually be but slight, and the principal effect of an increased contraction will be a diminution of the aperture in the antero-posterior diameter.

Pelvic Floor Aperture: Pirogoff's Plates.

These anatomical peculiarities of the pubo-coccygei and pubo-rectalis are very well shown by two drawings in Pirogoff's Atlas,[26] and are diagramatically represented in the figures appended. These drawings were taken from transverse horizontal sections of the pelvis. The first section passed through the ischial tuberosities and ascending rami forming parts of the pubic arch, and below the symphysis. The drawing of this section (Fig. 1) shows the horizontally disposed fibres of the pubo-rectalis passing continuously from the pubis of each side, backwards by the sides of the urethra, vagina and rectum, around the gut, without the intervention of connective-tissue or any attachment to the vertebral column. The fibres of origin are not shown, for they are attached to the pubic bones, which are above the section. This is to be explained by a presumable descent of the pelvic floor, which is common after death (Schultze[28]). It is to be noticed that the muscle has all the appearances of firmly embracing the tissues, forming the several passages, which pass through the aperture and form its contents, even although the muscle is relaxed, as it always is after death.

The next figure (Fig. 2) represents the drawing of the parts disclosed in a section through the pelvis, parallel with the former, but on a higher level. The section passed through the pubic bones and the symphysis, and through the upper parts of the ischial tuberosities. The obturator internus muscles are seen arising from the obturator membrane and the lateral pelvic walls; and medianly, separated from these muscles by the ischio-rectal fossæ, the pelvic floor aperture is displayed; still surrounded by the pubo-rectalis muscle, but also by fibres belonging to the pubo-coccygei, which pass backwards and upwards in the median line to be inserted into the vertebral column. The actual insertion is, of course, not shown, since the section has passed through the pelvis below the level of the coccyx.

Pirogoff, however, interpreted the muscle seen in the first section in a different way. He stated that the V- or U-shaped muscular sling consists of "circular fibres partly belonging to the external sphincter muscle of the anus, and partly indeed to the constrictor muscle of the vagina." Dr. Berry Hart, who has reproduced this drawing in his "Atlas of Pelvic Female Anatomy,"[2] accepted this interpretation and explained the muscle in the same way. Scrutiny of the drawing shows, however, that this explanation cannot be accepted. It is well known that the fibres taking part in the external sphincter ani muscle, as they course forwards on each side of the

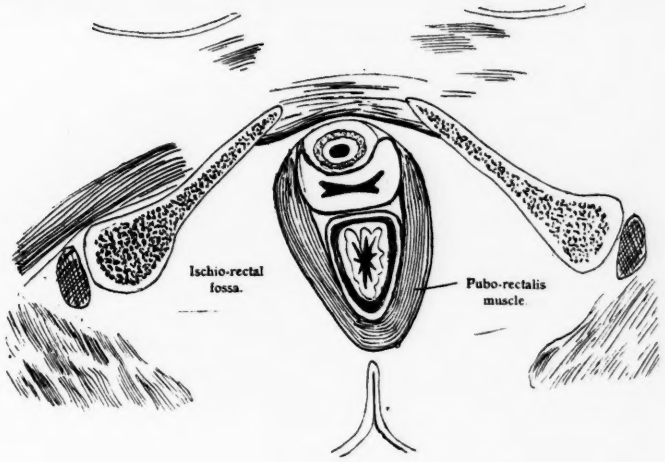

Fig. I.

From Pirogoff's "Atlas." Fasc. III. Tab. 28. Fig. 2.
(Reduced by $\frac{1}{2}$.)
Shows the Pubo-rectalis muscle embracing the rectum, vagina, and urethra. See text.

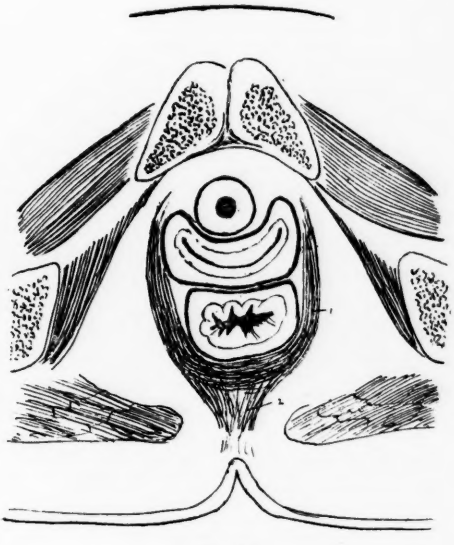

Fig. II.

From Pirogoff's "Atlas." Fasc. III. Tab. 28. Fig. 3.
(Reduced by $\frac{1}{2}$.)
1. Pubo-rectalis. 2. Pubo-coccygeus. See text.

anus from behind, pass inwards from each side immediately in front of the gut and behind the vagina, uniting in the median line with each other to form a complete ring encircling the anus, whilst others pass on laterally to the pubic arch (ischium) as the superficial transverse perineal muscle of the other side (Kalischer,[17] Thompson,[31] pp. 12 and 22). The two muscles, which together form the so-called "sphincter vaginæ," as is also well known, arise in the tissue in the middle line between the rectum and vagina (Kalischer,[17] Thompson,[31] p. 37), and pass forwards on each side of its extra-pelvic part to gain attachment to the crura of the clitoris (Mm. bulbo-cavernosi). The external sphincter of the anus, and this so-called sphincter of the vagina, the one placed behind the other in the superficial parts, together form a figure of eight.

In the section as represented, it is evident the plane of division has passed above these superficial structures, for the rectum and vagina are in close apposition—the section has not passed through the perineal body, but above it; it is evident, whatever this muscular band may be, which with the pubic arch so completely encircles the vagina and rectum, that the perineal body is below it. That this muscle is part of the levator ani, there can, I think, be no doubt; indeed, Pirogoff stated that the similarly placed fibres seen in the drawing representing the other section passing through the pelvis at a higher level—some of which have a similar circumferential course, whilst others decussate with each other behind the rectum and pass backwards towards the coccyx—are part of the levator ani. If this interpretation of these two drawings is correct—and that it is so is confirmed by palpation in the living—they demonstrate that the pubo-rectalis muscle is not only fairly thick, but that the muscle presents a considerable surface to the long axis of the gut, a relation which Halban and Tandler also point out. Moreover, if this muscle plays the part of a sphincter to the pelvic floor aperture, and thus prevents extrusion of any part abutting upon it within the pelvis—that is, if the tonic contraction of the muscle against the unyielding pubic arch causes retention of the viscera (and their contents)—it is plain that the perineal body, which is situated below the muscle, and is, therefore, outside the influence of the intra-abdomino-pelvic pressure, is out of the running in the question of the visceral support; and it further renders intelligible the fact that fibres passing between the muscle arm of one side to that of the other in the perineal body (*i.e.*, the pre-rectal fibres of the pubo-rectalis), and which, it has been supposed, act as a tie between the muscle arm of one side with that of the other side, preventing these from falling away from each other towards the side walls of the pelvis, and thus being rendered functionless (Hey Groves[12])—the presence of which, however, palpation fails to reveal, and which are so difficult to find on

dissection, and which Studdiford* [30] recently was unable to discover—are unnecessary. The pubo-rectalis muscle is, it is plain, of essential importance in the structure of the pelvic floor aperture, limiting it laterally and behind. That it plays the part of a sphincter, closing the aperture in the floor, and preventing the visceral escape, is shown by the effect its constriction has had upon the canals which pass through the aperture.

The Contents of the Pelvic Floor Aperture.

The rectum, vagina and urethra, in their transit from within the pelvic cavity to without, pass through the aperture and comprise the normal contents. Below or beyond this aperture the rectum and vagina diverge; whilst the gut suddenly changes its direction, to pass downwards and backwards as the anal canal, almost at a right angle to its former course; the vagina continues onwards almost in the same straight line, deviating but a little downwards. Usually these passages are occluded, their closure at the level of the pelvic floor aperture being effected by the tonic contraction of the pubo-rectalis. Below the level of the pelvic floor aperture the rectum and vagina, which are here separated by the perineal body, are also occluded; this is effected by the superficial sphincters, the external sphincter of the anus, being attached to the coccyx, anchoring the anus posteriorily.

At their exit from the pelvic cavity the arrangement of the rectum and vagina is somewhat peculiar, for their walls are attached, not only to each other, but also to the muscular boundary (Henle [9]). Thus, posteriorly and at each side, the smooth longitudinal fibres of the musculature of the gut intermingle with the horizontally disposed (striated) fibres of the pubo-rectalis; and the relationship between them is, therefore, very intimate. Anteriorly, a similar interweaving occurs, the anterior wall of the anal canal being more or less incorporated with the tissues of the perineal body (Kalischer [17] and others); and, moreover, a band of smooth muscle fibres passes downwards and forwards from the anterior rectal wall to the posterior vaginal wall—forming the recto-vaginal muscle (or band) of Kalischer. The importance of such a connection between the gut and the pelvic floor, during the act of defæcation, is obvious; for, whilst the increased visceral thrust causes the pelvic floor to descend, the attachment of the lower end of the rectum to this fixes the gut

* This author says: "So far as I have been able to determine no fibres from the levator ani muscles themselves pass between the vagina and rectum, as most anatomists state." He continues: "It is my opinion that these involuntary fibres (the ones he describes), found in the perineal body, are a most essential part of the pelvic floor, etc." As regards the function or the physiological importance of non-striated fibres, in this question, the reader is referred to Halban and Tandler's splendid book, p. 27.

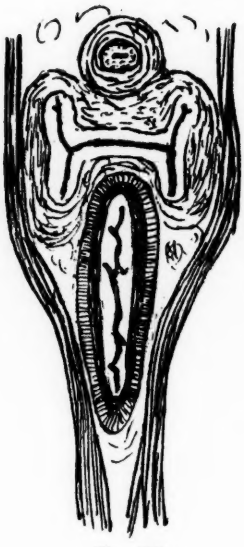

Fig. III.

Fig. III. A reproduction of Fig. 353 of Henle's "Anatomie" (1873), page 462. The drawing shows the H-shaped lumen of the vagina at the level of the pelvic floor aperture. The muscle fibres seen on each side of the visceral canals belong to the pubo-coccygei. The sinuous course of the muscle fibres is a post-mortem change. The pubo-rectalis is not represented; it is placed in a plane below the level of the section.

inferiorly, so that the fæcal mass can be forced onwards by the peristalsis of the upper part.

The lateral walls of the vagina are also firmly adherent to the lateral boundaries of the aperture, and, according to Henle,[9] a similar interweaving of the non-striated muscle fibres (mostly longitudinal) of the vaginal wall with the horizontally disposed striated fibres of the pubo-rectalis occurs; in no case, however, does a fibre of this muscle end upon or in the tissues of the vaginal wall (Henle, and Kalischer; compare footnote, p. 97). Thus, the parturient canal, inferiorly, is anchored to the pelvic floor; and this attachment is of similar importance during parturition as the similar fixation of the rectum is during defæcation. That this adhesion of the lateral vaginal wall to the pubo-rectalis is very intimate can be easily demonstrated by endeavouring to pick the wall from off the muscle during any vaginal operation. Of its anterior and posterior walls at this level, the urethra is closely bound to the former, whilst the latter is similarly adherent to the tissues of the rectum and at a lower level with those of the perineal body (Henle).

In consequence of the tonic contraction of the pubo-rectalis muscle, and the fact that the canals it embraces have of necessity at times to be considerably stretched (*e.g.*, during defæcation and parturition), their tissues are at this place considerably crumpled. The mucous membrane of the anal canal is thrown into longitudinal folds, and a similar modification of the vagina takes place, the mucous membrane being markedly rugous. Since, however, the lateral vaginal walls remain more or less fixed in place—on account of the intimate relationship of their deeper structures (fibro-muscular layer) with the pubo-rectalis, which, by its splint-like activity, maintains their positions—it, of necessity, follows, as a direct result of the tonicity of this muscle and the constricting force which it exerts, that the anterior and posterior vaginal walls at the same level, which have no such direct connection, are bulged bodily inwards—the anterior vaginal wall with the urethra being projected backwards, and the posterior vaginal wall forwards—until their surfaces come into apposition, forming the conspicuous folds which are known as the "columns of the vagina." Since the anterior vaginal wall and the urethra at the level of the aperture abut upon the unyielding pubic arch, whilst the posterior vaginal wall is supported by the elastic muscle, the rectum being interposed, the greater prominence of the anterior column of the vagina is accounted for. Thus the H-shaped appearance of the lumen of the vagina on transverse section at this level, so well depicted by Henle (Fig. 3), is explained. These columns extend a little above and a little below the level of the aperture in the pelvic floor, which is situated about half an inch (Dickinson[6]) above the vaginal orifice (hymen). Above the level of the aperture, where

the intra-pelvic part of the vagina, therefore, has no such lateral muscular fixation, its anterior and posterior walls are maintained in apposition by the internal visceral pressure, and on transverse section its cavity presents as a transverse linear slit. Below the level of the aperture the columns of the vagina also tend to disappear. Here the vagina is surrounded and embraced by the bulbo-cavernosus muscles (together forming the so-called sphincter vaginæ), which gather its tissues together somewhat in the manner that a purse-string suture would do; since, however, these muscles are attached to the crura of the clitoris in front, and to the perineal body behind, they cause the lateral walls at the orifice (position of hymen) to come into apposition, and thus on inspection this is seen as a longitudinal slit, which, however, in the virgin, is of no great length. Finally, when the pelvic floor aperture has become permanently enlarged, *e.g.*, by childbirth or other causes, the columns of the vagina are found to be much less conspicuous or to have entirely disappeared.

The Uro-Genital Diaphragm.

The rectum, vagina and urethra, although they pass from the pelvic cavity through a single aperture (the pelvic floor aperture), are so adherent to each other and the encircling musculature as to be fixed in position, and to form an efficient closure on all sides to the visceral mass. Below this level the urethra and vagina pass through the superficial sphincteric muscles. These, collectively, form a triangular tendinous muscular layer, let into the pubic arch, in a plane immediately below the pubo-rectalis muscle, *i.e.*, below the pelvic floor aperture, reaching backwards as far as the anterior limit of the anal canal; it has been called the uro-genital diaphragm (Halban and Tandler). The uro-genital sphincter (see Kalischer), in its distal part, where it surrounds both vagina and urethra, forms part of this diaphragm, but only a few of its superficial fibres are attached to the pubic arch (Kalischer); as its deeper portion is traced upwards its fibres gradually recede from the vagina, and embrace the urethra alone (compressor urethræ), and this, according to Kalischer, has no connection with the bone. If this uro-genital sphincter be disregarded, the uro-genital diaphragm contains but scanty muscle fibres (Halban and Tandler).

At first sight, it would appear that the compressor urethræ muscle, in virtue of those of its fibres which do pass from side to side of the pubic arch in front of the vagina, is of some importance from the point of view of preventing an escape of part of the pelvic contents to the outside through the pelvic floor aperture; and that it, therefore, plays a part in the maintenance of the visceral support. Anatomically, however, the muscle is sometimes difficult to demonstrate (P. Thompson), and a comparison with the levator ani shows it is relatively insignificant. Clinically, one finds, whilst the pubo-

rectalis is easily and distinctly palpable as a muscular band, clearly of considerable strength, that the lower part of the anterior vaginal wall, immediately above which the compressor urethræ muscle is situated, may be easily invaginated to such an extent that the internal aspect of the pubic bones and the symphysis can be completely and satisfactorily palpated. In this examination the compressor urethræ muscle is displaced with the other tissues, and no considerable resistance—no resistance comparable to that offered by the pubo-rectalis—is presented to the finger, such as we might reasonably suppose would occur did the muscle play a part in the visceral support, for if it prevents egress, presumably it would prevent ingress. In other words, the compressor urethræ muscle, though only separated from the finger by the anterior vaginal wall, cannot be distinguished by palpation, and, therefore, cannot be placed in the same category as the levator ani muscle. In view of the structural peculiarity of the pubo-rectalis, which permits the muscle on contraction to determine a closure of the pelvic floor aperture and an occlusion and compression of the canals which pass through it, and its sufficiency for this purpose, as shown by its hypertrophy during pregnancy (Dickinson [6] and the author [21]), coupled with the unsatisfactory findings on searching for the compressor urethræ muscle by dissection, lead one to conclude that the compressor urethræ muscle in man plays no part in the support of the pelvic viscera, and to deny it as forming a part of the pelvic floor. Its function is limited to the voluntary occlusion of the urethra (Halban and Tandler), of which it is the external (voluntary) sphincter, directly permitting, controlling or checking the expulsion of urine in virtue of its contraction. It is analogous with the external sphincter of the anus, and indeed has evolved with this from the same superficial sphincteric musculature which originally surrounded the primitive cloaca. It is of significance to find that in the female these superficial muscles, derived from the primitive sphincter cloacæ, do "not attain to anything like the degree of development as in the male" (Cameron [4]). This may be due to the injury resulting from some antecedent childbirth; as an anatomical opinion, however, it is of considerable importance.

Yet Halban and Tandler hold the opinion that the uro-genital diaphragm is of importance from the point of view of visceral support, and they regard it as playing the same part to the genital hiatus* as the pelvic floor itself plays to the outlet of the pelvic cavity; that is to say, they regard it as a closing apparatus, and they advance this opinion, even although they admit it often only contains

* The "genital hiatus" of Halban and Tandler is bounded in front by the posterior surface of the symphysis, laterally by the free borders of the pubo-rectalis, and behind by the pre-rectal fibres which meet in the perineal body, *i.e.*, in front of the rectum.

scanty muscle fibres. They even explain the non-appearance of prolapse in those not infrequent cases of ruptured perineum, in which the viscera continue to be retained within the pelvis by the existence of the uro-genital diaphragm (*ibid.*, p. 243); although, in an earlier part of their work, they call attention to the very considerable injury this diaphragm suffers on childbirth. Thus these authors say (p. 38):

> "Wie aus dem bisher Gesagten ersichtlich ist, bringt des Geburtstrauma nicht nur eine vorübergehende Erweiterung des Hiatus genitalis mit sich, sondern es ruft auch eine mehr oder minder *weitgehende, bleibende Schädigung*† im mechanischen Verschlussapparat des Hiatus genitalis, d.i. im Diaphragma urogenitale hervor."

They continue:—

> "Bemerkt sei noch, dass bei der Erweiterung des Introitus vaginæ vor allem die hinter der Vagina gelegenen Fasern geschädigt werden, da die Einlagerung der vorderen und der beiden seitlichen Vaginalwände in den Arcus pubicus einer weiteren Dehnung dieser Wände Halt gebietet" (*ibid.*, p. 38).

But this protection to the anterior and lateral parts of the uro-genital diaphragm afforded by the pubic arch can scarcely be conceded when we remember that, as the fœtal head appears at the vulva and begins to protrude through it, all the tissues on all sides of the fœtal head are reflected outwards upon its projecting part as a sort of cuff; and whilst the perineal body is, as a rule, the part that suffers most, this only happens because the long axis of the fœtal head in the process of birth passes through a curved course (extension) from behind downwards and forwards, and therefore the part of the head placed posteriorly (*i.e.*, the part related to the fourchette) is the part that moves most, for the arc it describes is greater than that through which the anterior part of the head passes. But, further, we know quite well that the anterior vaginal wall, especially in the region of the hymen, is often severely ruptured, although such injury is not often looked for, as are also those parts covering the vaginal bulbs, which then give rise to such troublesome bleeding. The reason prolapse does not occur in cases of ruptured perineum is due to the fact that the perineal body plays no part in the visceral support, being below the aperture and outside the region of pressure, and that the pubo-rectalis muscle surrounding the pelvic floor aperture remains intact in spite of—indeed, in some or many cases because of—the injury to the perineum; whilst the occurrence of prolapse with an intact perineal body, when directly consequent on child-birth, is due, as I have shown,[22] to the influence the perineal body exercises during the act of birth, causing a continued extension of the fœtal head, and thereby a greater distension of the pelvic floor

† [The italics are mine.—R. H. P.]

aperture than would otherwise occur, with a resulting increased stretching and greater liability to injury, *e.g.*, laceration, of the pubo-rectalis. Although Halban and Tandler lay stress on the pubo-rectalis—"auch als M. sphincter recti (Holl [16]) bezeichnet"—yet they appear to have rejected, or at least to have not sufficiently appreciated, the conception that the muscle serves the purpose of dragging the rectum (and with the rectum the vagina) forwards and against the pubic arch to such an extent as to efficiently and completely shut off the pelvic cavity and thus prevents extrusion of the viscera, for they also lay stress on the pre-rectal fibres which limit posteriorly the "genital hiatus," through which the vagina and urethra alone pass. And they do this even though they speak of "die variant entwickelten prärektalen Fasern" (*ibid.*, p. 36). Yet these authors expressly state that by the contraction of the pubo-rectalis the posterior border of the pelvic floor aperture (levatorspalt) through which the rectum, vagina and urethra all pass, is drawn towards the symphysis, and that this aperture is thereby correspondinly diminished in its sagittal diameter, a movement by which the rectum is also drawn forwards, and is, moreover, more markedly kinked and also narrowed (Halban and Tandler); but on the same page they say that the posterior wall of the vagina at its exit through the genital hiatus is raised towards the symphysis when the levator ani contracts, "und zwar zunachst indirekt durch die gleichartige Dislokation des Rektums, ferner aber auch durch die Verkurzung der prärektalen Fasern" (*ibid.*, p. 49). To these pre-rectal fibres, and to the fact that they cannot be perceived by palpation, we have already referred. That fibres, accorded of such importance, may be divided by a laceration at childbirth—even into and through the external sphincter of the anus, so that no doubt can exist that they are rendered functionless—and that, in spite of such complete laceration, no effect should be caused as regards the visceral position (which, as is well known, is quite a common occurrence), is passing strange; for were they necessary for visceral retention, as is so often insisted, their rupture should be more frequently followed by prolapse than is the case; and that these authors should have to explain such visceral retention by falling back upon the uro-genital diaphragm, and saying that this remains intact—when contrasted with the mechanism of occlusion of the pelvic floor aperture which the pubo-rectalis so clearly effects, plus the difficulty of finding and displaying the pre-rectal fibres, or, indeed, of the other superficial muscles in this diaphragm—is, to say the least, remarkable. Does not the true explanation lie in the conception that neither the insignificant pre-rectal fibres nor the scanty muscle fibres in the uro-genital diaphragm are of any service in the visceral support?

Yet Halban and Tandler have been widely followed. Thus Piquand and Hue [25] attribute to these scanty pre-rectal fibres (releveur

pubo-vaginal) the constriction of the wax cylinders which Budin* [3] used in his experiments, and the results Farabeuf [7] obtained with the dynamometer. The latter observer found that such an instrument placed within the vagina indicated an increase of pressure which reached 12 to 15 kilogrammes, when "these muscles contract." It is plain that if such effects were produced by the muscle fibres passing from side to side in the perineal body, that these ought to be sufficiently numerous to form a muscular mass capable of being perceived by palpation; and much more ought they to be found easily on dissection. The actual findings disclose that the effective constrictor, to which these results were undoubtedly due, is not situated within the tissues of the perineal body, but is the main mass of the pubo-rectalis muscle, which passes behind the rectum, and which forms such a conspicuous fleshy structure that it can be so easily and plainly felt.

In support of their contention, Halban and Tandler (*ibid.*, p. 240) state that prolapse is observed very frequently after symphysiotomy and pubiotomy; for during these operations, and much more during the subsequent extraction of the child, the uro-genital diaphragm is certainly lacerated considerably as the pubic bones are thrust apart; and, further, that prolapse almost invariably follows childbirth in cases of split pelvis, because of a similar injury. Even if it be allowed that prolapse is more likely to occur after childbirth associated with these conditions, it seems more probable that the visceral extrusion is disposed to by the sometimes slight, but sometimes considerable, widening of the pelvis, which is permanent, and which almost invariably results in such cases (Whitridge Williams,[32] Munro Kerr [19]), rather than to the injury inflicted upon the uro-genital diaphragm; for this widening necessarily results in a simultaneous and a corresponding and permanent increase in width of the pelvic floor aperture, which of itself is sufficient to explain the occurrence of prolapse, and which, according to Adolph,[1] is its most frequent concomitant. And, further, it is extremely probable that the extraction of a full-term child through a pelvis so small that such an operation had been necessary to permit live delivery—a pelvis, that is, with correspondingly small muscles and a small aperture—would not only result in an immediate injury to the uro-genital diaphragm, but also subject the levator ani muscle itself (pubo-rectalis) to a more or less severe laceration.

The Closure of the Pelvic Floor Aperture.

For such reasons as these then, the uro-genital diaphragm must be rejected as being of any value in the maintenance of the pelvic viscera within the pelvic cavity. This retention is effected by the

* Budin thought the same, for he says (*ibid*): "La formation d'un veritable anneau autour du vagin serait surtout la conséquence du développement exagéré de la partie appelée par Savage muscle pubic-coccygien et au particulier des faisceaux qui se croisent entre le rectum et le vagin."

tonic contraction of the pubo-rectalis, on the one hand, and the mere mass of the structures which pass through the aperture it limits—*i.e.*, the thickness of the walls of the canals and the connective-tissue which binds them into one heterogeneous whole—on the other. The former, ever varying in response to the needs of the body, *i.e.*, the momentary prevailing pressure conditions within the abdomino-pelvic cavity, maintains a sufficient pressure—from behind forwards, and, to a lesser extent, from side to side—upon the collective mass of these structures, so as to effect their closure and prevent egress from, and ingress to, the pelvic cavity in accordance with the demands of the moment in question. This it can readily do, for it is free from connection with the vertebral column and the ano-coccygeal ligament behind; and the cells which form the contents of the pelvic floor aperture are—like all tissue cells—incompressible.

Moreover, by the position assumed by the posterior commissure of the pubo-rectalis, the pelvic floor aperture is removed from the region of impact of the visceral pressure from above, for this is transmitted through the axis of the brim and strikes the pelvic floor in the region of the coccyx—the pelvic floor aperture is not in the direct line of pressure, as has been supposed,—and the rectum has been caused to form a conspicuous perineal flexure, the vagina also being affected, as is shown by its sigmoid course.

Thus, by this compression from behind forwards against the pubic arch, an occlusion of the rectum and vagina is easily determined. Because of this action upon the gut, Holl called the pubo-rectalis the sphincter of the rectum. Its action upon the vagina is similar, for this passage at the level of the aperture is only separated from the posterior commissure of the pubo-rectalis by the gut and the intervening tissue in the recto-vaginal septum. Thus the muscle plays an important part during coitus (Hildebrandt [15]), sometimes causing retention of the penis within the vagina—penis captivus—as Hildebrandt, Budin and others have given instances; and, according to Dickinson,[6] the muscle is especially well developed in erotic women and in patients suffering from painful lesions about the vulva and anus, *e.g.*, fissures, as well as in muscular subjects, *i.e.*, in those accustomed to hard work, as young domestics, and in women with wide pelves. This sphincteric action is further shown by the pleating or crumpling of the passages at this level.

That the pubic arch plays a prominent part in this mechanism is shown by the marked indentations which were produced anteriorly in the wax cylinders Budin used to investigate this closure of the vagina. Impressed by Hildebrandt's paper, Budin [3] investigated the sphincteric action of the levator ani by inserting a cylinder of wax, 37 mm. in diameter into the vagina, the muscle being voluntarily relaxed, and then getting the patient to contract or draw up the parts as much as possible. After subsequent relaxation the cylinder was

removed. Examination showed an impression had been formed in the wax which, whilst completely encircling the cylinder, was most marked anteriorly, corresponding to the lower border of the symphysis. Measurement of the constricted part showed that the antero-posterior diameter, instead of 37 mm., measured only 26 mm., and the transverse diameter 35 mm. In another patient, who was pregnant, the contraction was more powerful still, the antero-posterior diameter of the resulting constriction being found to measure 24 mm., and the transverse diameter 32 mm., instead of 37 mm. in each.

This experimental work of Budin, which has been confirmed by Dickinson, shows that on active contraction of the levator ani muscle the aperture in the pelvic floor, previously distended, may be considerably reduced, and that the reduction takes place for the most part in the antero-posterior diameter of the aperture. This is caused by an advance of the posterior commissure of the muscle towards the symphysis, which determines a constriction and occlusion of the rectum and vagina, already referred to. The reason why the impression, posteriorly and laterally, was less deep than in front is to be found in the fact that, whilst the muscle fibres form a fairly broad band at the sides and behind, the anterior limit of the aperture formed by the inferior margin of the pubic arch is sharp (Budin). Budin adds that it is certain a much greater constriction than that found in the cases reported would have been obtained by using a substance less resistant to the muscular contraction than the fairly firm modelling wax, and which at the same time had possessed the capacity of preserving its resulting form. What reduction takes place when the vagina is empty we cannot tell; but we know that in vaginismus this muscle is so contracted that it is impossible to insert a finger into the passage. It is obvious the potential closure of the aperture in the pelvic floor by the activity of the pubo-rectalis muscle is considerable; it is, indeed, so effective in the majority of women as to maintain the pelvic viscera within the pelvis.

In support of this conception the following may be adduced: —

A. As regards the *Pubo-rectalis Muscle.*

1. Its muscular development. (See Holl.[16])

2. Its presenting a broad surface to the passages which pass through the aperture it limits (Tandler and Halban).

3. Its strength. (See Dickinson.[6])

4. Its ability, in virtue of its striated tissue, to function continuously throughout life (see Sherrington [29] and Pembrey [23]), to react rapidly to rapidly occurring pressure changes, and to adapt itself to more slowly occurring pressure conditions (hypertrophy).

5. Its sphincteric action upon the rectum (Holl) and upon the vagina (Hildebrandt, Budin and others).

6. Its spasm in vaginismus.

B. As regards the *Passages which pass through the Aperture.*

7. The existence of the columns of the vagina depend upon the continued activity of the pubo-rectalis.

8. The existence of the perineal curvature of the gut and the sigmoid course of the vagina are similarly dependent upon the continued activity of the same muscle.

The Retention of the Viscera during Straining.

That such a mechanism surrounding the pelvic floor aperture is all important for the prevention of the escape of the viscera may be readily allowed; but that it is not the only factor is evident from the fact that during bearing down efforts a descent of the pelvic floor, with an increase in the size of its aperture, occurs; for inspection shows that a greater length of the obliquely placed anterior column of the vagina "comes down" and occupies part of the pelvic floor aperture. Since during this movement the visceral pressure is increased—for it is this increase which causes the *inhibited* pelvic floor to descend—the question arises: How is extrusion of the viscera prevented at these times? It will be allowed that such straining is of infrequent occurrence, that, although great increase of the visceral pressure may be produced frequently in the course of each day by such acts as lifting weights, coughing, etc., in which cases, however, a maximal contraction of the pelvic floor is always possible and presumably occurs, such increase as that caused by straining, in which the pelvic floor is inhibited, and, therefore, is not capable of contracting maximally, is rare, and, indeed, only happens in connection with difficult defæcation (and parturition); and, further, if such straining does occur frequently prolapse often results. But the increase in size of the pelvic floor aperture consequent on straining is presumably not unlimited, and, therefore, it is necessary to ascertain the amount of descent of the pelvic floor and the increase in size of the aperture incident to straining.

Some twenty years ago Dr. Herman [10] measured the descent of the pelvic floor produced by straining in 110 cases, and found on the average an increase of the superficies from before backwards of 3·04 cm. occurred; that is to say, just a little over an inch. I have made similar measurements to these in 27 cases (see Appendix), and, although there is a good deal of disparity between the extremes—the greatest increase being two inches, the smallest only a quarter of an inch—on the average the increase measured 0·96 of an inch. The result of such measurements depends, of course, upon the kind of patient; a few marked cases of prolapse would send up the average very considerably. There were a few cases of prolapse in my list, but in none was the prolapsed mass large, and most of these were wearing rings. Since, however, such cases are included, it would seem that normally the average increase on straining is less than

seven-eighths of an inch. As regards the actual descent of the pelvic floor in health, Dr. Herman [11] says:—"The perineum ought not to descend more than about half an inch when the patient strains."

Retention during Straining. Measurements.

It must be admitted that the measurements obtained are remarkably small, much smaller than one would think. In some cases that I have examined, the patient lying on her left side, there has appeared to be no descent at all on straining. In such it will generally be found that the abdominal contents are small in volume, and that when the patient turns on her back the abdominal walls sink in towards the spine. Thus, in these cases, when the patient is lying on her side, it will be very difficult for her to markedly raise the intra-abdomino-pelvic pressure, at least sufficiently to cause the viscera to bulge the pelvic floor downwards; and to do this effectively she must diminish the capacity of the abdomino-pelvic cavity by flexing the spine and causing the thorax to approach the pubes. This is equivalent to possessing relatively increased abdominal contents, in which condition it is easy to produce an increase of the intra-abdomino-pelvic pressure in any position. That is to say, the crouching attitude must be adopted, as, indeed, is usual when defæcation is attempted. Hence the relative capacity of the abdomino-pelvic cavity and the volume of the abdomino-pelvic contents is of considerable importance—a relation which is, as a rule, entirely overlooked in the consideration either of the maintenance of the pelvic visceral position or of the causes which determine prolapse of the same.

It is somewhat difficult to obtain exact ideas as regards the size of the pelvic floor aperture, since the tonic contraction of the pubo-rectalis muscle is always varying in response to the pressure within, and which depends, of course, upon the posture of the individual and the movement (if any) in progress. Measurements in a resting position cannot be taken as showing the actual size when the muscle is vigorously contracted, as when the individual determines to prevent ingress to, or egress from, the abdomino-pelvic cavity; nor can measurements after death, when the tone of the muscle has disappeared, be supposed to represent the actual conditions during life.

Several measurements, however, have been taken of this aperture. According to Halban and Tandler (*ibid.*, p. 36), the transverse diameter, which corresponds to the greatest distance between the two arms of origin of the pubo-rectalis muscle, and normally measures as much as the transverse diameter of the vagina where this passes through the aperture, is found to be:

In new-born children	1 cm.
In virgins	2½ cm.
In women who have borne children	4 cm.

The longitudinal diameter—measured from the inferior margin of the symphysis to the anterior wall of the empty rectum and the perineal curvature—comes to:

In new-born children	$1\frac{1}{4}$ cm.
In virgins	4 cm.
In women who have borne children	5 cm.

These authors do not say how they arrived at their results, *i.e.*, whether they made their measurements on the living or on the dead, and if on the former under what conditions.

Piquand and Hue [25] and Hey Groves [13] have made measurements, independently, of the interval between the arms of the muscle at their origins from the pubic bones; the former found a separation of 25 to 30 mm., the latter one of 2 cm. The conditions under which the measurements were made are not stated; presumably they were taken on the dead.

Adolph [1] has made observations on the width of the pelvic floor aperture by testing the number of fingers that could be passed simultaneously side by side into it. He says:—"Einen geringeren Breitendurchmesser des Levatorspaltes als zwei Querfinger haben wir nach Gebturten nur selten angetroffen. Es scheint dies der Normalbefund bei der weitaus grössten Mehrzahl aller Frauen zu sein, die geboren haben." It is difficult or impossible to make measurements in virgins or in nulliparæ, because the uro-genital diaphragm in these is uninjured, and, being superficially placed, is in the way.

I have measured the length (*i.e.*, the antero-posterior diameter) of the pelvic floor aperture in the living in 39 cases, both at rest and during bearing down efforts, each patient lying on her left side. (For results, brief notes and methods used see Appendix.) The results show that on the average in the normal the length of the aperture is one and a half inches, and that on straining an increase of about half an inch occurs. When any substance is able to enter the aperture during straining the increase is greater, and may be considerable. It is obvious that such an increase will occur during defæcation as the fæcal mass is being extruded; and during parturition a similar, but much larger, enlargement, indeed an enormous distension, results; for both the rectum and the vagina leave the pelvis by passing through the pelvic floor aperture, and whatever distends these passages during its transit will correspondingly distend the muscle placed around them and cause an enlargement of the aperture. The occurrence of this increase is best shown experimentally in cases of prolapse. I also found that on straining the increase in the length of the pelvic floor aperture is greater than the increase in the distance between the anus and the symphysis.

During this enlargement of the pelvic floor aperture, the result of the straining, the bladder, which is placed immediately above the

aperture and overlaps its borders for a considerable distance all round, is, it is plain, pressed more firmly downwards; and, although in the region of the aperture it is unsupported, yet laterally, in front and behind, it is still supported. Thus on each side it is compressed against the arms of origin of the pubo-coccygei; in front, against the broad surface formed by the upper and internal aspects of the pubic bones and symphysis; behind, against the upper part of the vagina, which itself is pressed against the rectum, and this in turn against the part of the pelvic floor behind the anus. This circumferential pressure is sufficient to prevent the bladder from being protruded through the pelvic floor aperture, enlarged by straining, provided this straining is not excessive and not too often repeated. This maintenance of the bladder is comparable to the maintenance within the pelvic cavity of the fundus of the uterus in those cases of partial prolapse of the uterus, in which the cervix is extruded and the organ considerably elongated. For whilst the pressure within presses out the cervix, the same pressure compresses the fundus against the pelvic floor, and holds it there with such force that the uterine body is coerced to stretch rather than to cause a descent of the fundus. This is Halban and Tandler's explanation. That there is a considerable tension between the fundus and cervix in these cases is shown by the fact that when the prolapse is reduced the elongation of the uterus, which this tension has caused, is within a very short time very much reduced as the sound easily demonstrates. That such retention of the fundus is not due to the connective-tissue attachments of the uterus is shown by the fact that with the displacement of the cervix the perivascular connective-tissue attaching it to the side walls of the pelvis has, in the majority of cases, similarly been displaced and stretched; whilst the retained fundus is only connected with the pelvic walls by the admittedly non-supporting broad ligaments, round ligaments, ovarian ligaments and their continuations the infundibulular ligaments, and the peritoneum. The possibility of such retention of the uterine fundus by pressure alone has been shown by Halban and Tandler experimentally by means of a phantom pelvis.

The same mechanism which maintains the fundus of the uterus within the pelvis whilst the cervix is expelled, and the uterine body consequently stretched and elongated, is also capable of maintaining the bladder in position during moderate straining. The size of the normal pelvic floor aperture during such straining is only 2 inches long or less, by about an inch, or a little more than an inch, broad; whilst the area of the bladder in relation to the pelvic floor and pubic bones, both antero-posteriorly and from side to side, is much more than this. If the pressure is excessive it causes the part of the bladder immediately above the aperture to bulge through, protruding the anterior vaginal wall before it, with the eventual formation of a

cystocele, which acts as a dilating wedge and causes an increasing enlargement of the aperture. It is plain this mechanism can more easily occur in cases in which the pelvic floor aperture is permanently widened by childbirth or other causes (*e.g.*, repeatedly recurring straining).

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APPENDIX.

APPENDIX: Being details of the methods used and the measurements made of the length of the pelvic floor aperture in 39 cases, both at rest and during bearing down efforts, of which 5 were taken both before and after labour, and in 27 of which measurements over the superficial soft parts covering the pelvic floor in the antero-posterior plane were also taken, both with the patient at rest and subsequently during straining. In all cases the patient was lying on her left side.

1. Of the antero-posterior superficies covering the pelvic floor.

Three points were chosen, and for facility in noting were called A, B and C. By A was designated the mid-point of the line joining the two posterior superior iliac spines; B was placed at the mid-point of the anus; C was the mid-point of the superior border of the symphysis pubis. The tape was applied along the parts with its beginning at C; endeavour was made to keep it fixed there in the same place during the two readings in each case. BC was first read off, and then AC. The patient was then asked to bear down, and the measurements were again taken. No notice was taken of the fourchette, nor of the length of the perineal base.

2. Of the antero-posterior diameter of the pelvic floor aperture.

A pair of specially constructed straight armed callipers, with scale attached giving distances between the blunted ends in fractions of an inch, was used. One arm was passed into the anal canal until its end had reached its upper limit, as could be ascertained by passing a finger into the lower part of the vagina. The end of the calliper could be felt through the apex of the perineal body. In this position it was immediately in front of the posterior commissure of the pubo-rectalis muscle, being separated from it by the posterior wall of the gut alone. In order to keep the instrument in position and prevent it from slipping in too far a section of an ordinary cork was previously slid upon the arm and adjusted about an inch or an inch and a half—depending upon the depth of the anal cleft—from

its extremity. The instrument was passed with the patient lying upon her left side, and was held in the examiner's left hand. The thumb of the right hand was then placed on the mid-point of the inferior margin of the pubic arch and the right fore-finger upon the adjacent part of the antero-inferior surface of the symphysis. Between these two digits the extremity of the other arm of the callipers was adjusted, so that its end abutted upon the mid-point of the inferior margin of the pubic arch, and the greatest care was taken to maintain it there. The distance between the two arms was then read off. The instrument being maintained in this position, the patient was asked to bear down. On doing so the arms of the instrument were still further separated, and the measurements at the acme of the greatest excursion attained read off. The increase of the latter over the former gave the amount of the recession of the posterior commissure of the pubo-rectalis.

3. Comparison of increase of superficies with that of pelvic floor aperture on straining.

Since, in taking these measurements, the patient is asked to strain on two separate occasions—first, for the tape-measure, and, next, for the callipers—and since it is impossible to be certain the amount of straining in each is the same, it is scarcely possible to make comparisons between the two sets of measurements with anything like exactness; for such a purpose it would be necessary to make both measurements simultaneously, and that could not be done very easily. Moreover, even when the greatest care is taken, it is extremely difficult to get measurements along the soft parts with a tape true to one-eighth of an inch. Slight displacement of the tape to one or other side, and a different tension in the tape, cause considerable differences; and the length of the anal orifice is considerable, and it is not always easy to be sure the second measurement was taken at the same *point* as the first. Hence the measurements cannot be taken as absolutely correct, but endeavour was made to make them as correct as possible.

With this reservation the results of the two measurements may be compared, which brings out rather interesting points. It shows that on straining the increase in the length of the aperture is greater than the increase in the distance between the anus and the symphysis. This increase in the table is designated by BC, and is expressed in eighths of an inch. The increase in the size of the aperture is shown by the figure in the column on the extreme right, and is also expressed in eighths of an inch. The total (antero-posterior) increase of the soft parts superficial to the pelvic floor on straining is designated by AC, similarly expressed in eighths of an inch. It will be seen that in the majority of the cases (*i.e.*, in two-thirds of those in which both sets of measurements were made) that Ap.—the increase in the aperture on straining—is greater than BC—the

increase in the distance between the anus and symphysis on straining. The fact that this occurred in the majority of cases is, I think, sufficient to show that in those cases in which the reverse occurred that the straining was not so great when the measurement for the aperture was being taken as when BC was being estimated. (*e.g.*, Cases 33 and 34). And, on the other hand, since Ap. is in a few cases inordinately greater even than AC (as in No. 36), we may conclude that the straining when Ap. was being measured was much greater, or at least more effective, than when the tape measure was being used.

The greater length of the aperture on straining shows that the angle formed by the terminal part of the rectum proper (*i.e.*, intra-pelvic) and the anal canal, which at other times measures about a right angle, is correspondingly increased; *i.e.*, that the long axes of the rectum and anal canal tend to fall into the same straight line. During straining the down-thrust of the viscera causes the posterior commissure of the pubo-rectalis to recede and a corresponding enlargement of the aperture to occur. This posterior recession is greater during defæcation, and much more so during parturition, as the fæcal mass, on the one hand, and the ovum, on the other, is being extruded; as these pass they occlude the aperture.

I endeavoured to show graphically that the direction of the anal canal did change during bearing down, as these measurements show actually occurs; but I was unable to do so, for on straining the light lever I inserted into the anal canal was expelled. Since with the descent of the pelvic floor the position of the anus advances in relation to the descent of the ano-coccygeal raphe, as demonstrated by these measurements, they also show that the increase in the distance between the mid-point of the posterior superior iliac spines and the anus, consequent on bearing down, is determined, not by a stretching of the ano-coccygeal raphe, although this may occur to a slight extent, but is chiefly due to this alteration in the direction of the anal canal and to a stretching of the tissues which surround its terminal part, *i.e.*, skin, fat and external sphincter and muscle. This becomes most marked during parturition.

The measurements of the pelvic floor aperture also show that on the average in the normal the length of this aperture is $1\frac{1}{2}$ inch, and that on straining an increase of about half an inch occurs. When any substance is able to enter the aperture during straining the increase is greater and may be considerable. This is best shown in cases of prolapse. The value of the ring pessary was prettily demonstrated in Case No. 6, for whilst the ring was in place only a slight increment occurred, viz., 2 eighths, *i.e.*, $\frac{1}{4}$ inch; but when the ring was removed and the patient again strained an increase of nearly an inch was obtained. The ring prevented the entrance of the superimposed viscera into the aperture, and in this way safeguarded the pubo-rectalis from the pressure they would otherwise have caused.

and this protection allowed the inefficient muscle to occupy a position in which the length of the aperture during the dangerous period of straining measured $1\frac{3}{4}$ inches. When the ring was removed the viscera were extruded with a resulting enlargement. The result of allowing the prolapse to remain "down" is shown in Case 18, in which the aperture during rest measured $3\frac{1}{4}$ inches. Thus the value of the ring pessary is experimentally proved. The fact that no such change occurred on removing the ring in Case 27 shows that in this case the prolapse was cured, and it is probable that the patient might have left off using the pessary with safety, especially if means had been taken to reduce the volume of the abdomen and increase the efficiency of the muscles enclosing the abdomino-pelvic cavity by massage, exercise or electricity.

In the great majority of the cases no effect on the size of the aperture was obtained on coughing, only in one case (No. 12) in which labour was in progrss and the head was engaging the aperture, did coughing produce any result. In this case the longitudinal diameter of the aperture diminished by $\frac{1}{4}$ inch. In all cases, however, the muscle undergoes an increased contraction during coughing, as palpation readily demonstrates.

That the pelvic floor aperture does not usually diminish on coughing is explained by the fact that the increase of visceral pressure necessitated by coughing is transmitted through the pelvis along a line drawn at right angles to the centre of the plane of the pelvic brim, and strikes the pelvic floor in the region of the coccyx, considerably behind the pelvic floor aperture, anl only reaches the aperture by diffusion through the plastic visceral mass. Such increase of pressure is only momentary, as is shown by the manometer attached to a bag in the rectum, for on coughing the mercury shoots up to a great height, but drops as suddenly; and thus, owing to the position of safety adopted by the pelvic floor aperture and the plasticity of the visceral mass, escape of the viscera is prevented. The influence of excessive and frequent coughing in the production of prolapse is well known. When the visceral pressure becomes continuously increased, as occurs in pregnancy and in other conditions (corpulence), a corresponding hypertrophy of the pubo-rectalis (with a similar increase of the other parts of the pelvic floor, *e.g.*, ilio-coccygei) occurs.

AC signifies the increase of the antero-posterior superficies of the whole pelvic floor on straining.

BC signifies the increase of the superficies of the pelvic floor anterior to the anus in the sagittal plane on straining.

Ap. signifies the increase in the antero-posterior diameter of the pelvic floor aperture on straining.

These are expressed in eighths of an inch to facilitate comparison. The measurements of the antero-posterior diameter of the pelvic floor aperture, at rest, and during straining, are expressed in inches.

The numbers with the asterisk signify the cases in which measurements of the superfices were taken.

No.	Name.	Age.	Pregnancy and Children and date of last child.	Disease, Condition, etc.	AC.	BC.	Aperture.	Ap.
1.	H.C.	35.	Multipara	——	—	—	$1\frac{5}{8}$ to $2\frac{1}{8}$	4
2.	S.M.	61.	P. 5, C. 5, 1882 ...	Prolapse for 8 years since 1900, influenza and several bad coughing attacks.	—	—	2 to $2\frac{1}{2}$	4
3.	J.C.	50.	P. 5, C. 2, 1890 ...	Prolapse following confinement of first child 1887, getting steadily worse ever since.	—	—	$1\frac{7}{8}$ to $2\frac{1}{2}$	5
4.	M.B.	67.	P. 5, C. 4, 1887 ...	Prolapse since third child, very stout. Interesting to notice the gradual increase of aperture on straining.	—	—	$1\frac{7}{8}$ to $2\frac{3}{8}$	4
5.	L.W.	46.	P.10, C.9, 1901...	Womb came down after second child. Not stout, ring 18 years.	—	—	$1\frac{3}{4}$ to 3	10
6.	M.A.H.	35.	P. 3, C. 3, 1903...	Prolapse dates from last confinement.				
				With ring in	—	—	$1\frac{1}{2}$ to $1\frac{3}{4}$	2
				With ring out...	—	—	$1\frac{1}{2}$ to $2\frac{3}{8}$	7
7.	L.P.	32.	P. 10, C. 6	Fibroid.	—	—	2 to $2\frac{1}{2}$	4
8.	X.Y.	...	... ...	? Fibroid.	—	—	$1\frac{1}{8}$ to $1\frac{1}{2}$	3
9.	A.M.	58	... ...	Prolapse. Abdomen full, girth 40 in., abdominal muscle good, no separation of recti, ring 14 years.	—	—	$2\frac{1}{4}$ to $2\frac{3}{4}$	4
10.	A.J.	37.	P. 12, C. 10, 1908...	Rectocele and cystocele. "Bowels a trouble."	—	—	$2\frac{1}{4}$ to $2\frac{7}{8}$	5
11.	A.P.		Primipara	Head in pelvis, labour in progress.	—	—	2 to $2\frac{1}{4}$	2
*11.	A.P.	...	... ...	24 days after labour. Girth $28\frac{1}{2}$ in., slight separation of recti, right kidney plainly felt on deep respiration, left also; mentally defective, does not bear down properly.	7	—	$2\frac{1}{8}$ to $2\frac{1}{2}$	3
12.	L.W.		Primipara	Head on floor, engaged in aperture. On coughing aperture reduces to $2\frac{1}{2}$ in.	—	—	$2\frac{3}{4}$ to $3\frac{1}{4}$	4
*12.	...	...	... ...	21 days after labour; persistent occipito-posterior position reduced by hand and forceps, considerable laceration of vagina and perineum. Complains bearing down pains; abdomen flat, muscle poor, considerable separation of recti $1\frac{3}{4}$ in., neither kidney felt (has only been up one day), girth $25\frac{3}{4}$ in., pelvic floor muscle felt best per rectum.	6	—	$1\frac{3}{4}$ to $2\frac{1}{4}$	4

No.	Name.	Age.	Pregnancy and Children and date of last child.	Disease, Condition, etc.	AC.	BC.	Aperture.	Ap.
13.	E.P.		Primipara	Pregnant, head in pelvic cavity, os size of 2s. 6d.	—	—	$1\frac{3}{4}$	no change on straining.
*13.	...	...	... ...	21 days after labour. Girth 28 in., no separation of recti, neither kidney felt, rectum loaded; this explains why patient did not bear down well.	3	—	$1\frac{3}{4}$ to 2	2
*14.	E.C.	22.	P. 1...	Two months after labour, reputed weight of child 12 lbs., second stage very long, great posterior-rectal bulging. Prolapse. Abdominal muscle good, very slight separation of recti, girth $28\frac{1}{2}$ in.				
				First reading, August 21 1908	10	2	2 to $2\frac{7}{8}$	7
				Second reading, August 28 1908	9	4	$1\frac{1}{2}$ to $2\frac{1}{4}$	6
*15.	E.M.	20.	Primipara	Pregnant.	7	3	$1\frac{1}{2}$ to $2\frac{3}{8}$	7
15.	E.M.	20.	P. 1, C. 1	22 days after labour. No separation of recti, girth 29 in., right kidney felt.	8	4	$1\frac{3}{8}$ to $2\frac{1}{2}$	9
*16.	...	...	... ...	Cystocele.	8	5	$1\frac{3}{4}$ to $2\frac{3}{8}$	5
*17.	M.W.	56.	P. 6, C. 6, 1894 ...	Prolapse for 2 years, winter cough for years. Very stout, girth $40\frac{1}{2}$ in., 3 in. separation of recti, not so strong as formerly.	16	4	$1\frac{1}{2}$ to $2\frac{1}{2}$	8
18.	J.S.	61.	P. 5, C. 5, 1883 ...	Prolapse posterior vaginal wall, no rectocele; first noticed 16 years ago, ring 8 years, since cup and stem pessary. Girth $34\frac{1}{2}$ in., no separation of recti, abdominal muscle good, pelvic floor muscle deficient anteriorly (most median and anterior fibres have disappeared), elsewhere remarkably good.	—	—	$3\frac{1}{4}$ to $3\frac{3}{4}$ or 4	4 6
*19.	A.W.	30.	P. 1	17 days after labour.	11	4	$1\frac{3}{4}$ to $2\frac{3}{8}$	5
*20.	M.S.	22	... ...	Endometritis.	9	2	$1\frac{1}{2}$ to $2\frac{1}{4}$	6
*21.	R.S.	20.	Primipara	Pregnant.	8	3	$1\frac{1}{4}$ to $1\frac{3}{4}$	4
*22.	D.	26.	P. 3, C 2, 1908... ...	——	10	3	$1\frac{1}{4}$ to $2\frac{1}{8}$	7
*23.	M.N.	24.	P. 4, C. 4	——	6	4	$1\frac{5}{8}$ to $2\frac{3}{8}$	6

No.	Name.	Age.	Pregnancy and Children and date of last child.	Disease, Condition, etc.	AC.	BC.	Aperture.	Ap.
*24.	E.D.	20.	Primipara	Pregnant. Girth 35 in., abdominal muscle good, $2\frac{3}{4}$ in. separation of recti (patient would not, or could not bear down). Muscle of pelvic floor very good (hypertrophied).	2	1	2	no change on straining.
24.	E.D.	P. 1, C. 1	... ...	16 days after labour. Slight separation of recti, girth $28\frac{1}{2}$ in.	4	4	$1\frac{3}{4}$ to 2	2
*25.	F.M.	25.	P. 1	Labour 18 days ago. Girth $25\frac{1}{2}$ in., abdominal muscle good, no separation of recti, perineum intact, levator ani muscle very good condition, neither kidney felt.	7	4	$1\frac{5}{8}$ to $2\frac{1}{2}$	7
*26.	L.S.	19	... ...	Confined 20 days ago. Girth 28 in., no separation of recti, left kidney not felt; right kidney, lower pole and anterior surface felt, muscle of pelvic floor good, no perineal tear.	9	4	$1\frac{5}{8}$ to 2	3
*27.	L.C.	58.	P. 10, C. 9, 1886 ...	Prolapse. Abdomen voluminous, girth 33 in., $\frac{3}{4}$ in., separation of recti, abdominal muscle pretty good, pelvic floor muscle fair.	9	3	$1\frac{3}{4}$ to $2\frac{3}{8}$	5
				Ring was now removed, parts again measured; no protrusion, and little change in measurements; standing erect, lower abdomen is pouched.	9	4	$1\frac{3}{4}$ to $2\frac{1}{2}$	6
*28.	M.P.	32.	P. 2, C. 2, 1905 ...	Prolapse since 6 weeks after first child. Girth $22\frac{1}{2}$ in., recti separated $\frac{3}{4}$ in., abdominal muscle not good; anal cleft a wide, shallow groove, patient very thin; pubo-rectalis pretty good, ilio-coccygei poor, can scarcely feel it contract on coughing.	10	5	$1\frac{1}{2}$ to $2\frac{1}{4}$	6
*29.	B.G.	32.	P. 10, C. 2, 1908 ...	Girth $27\frac{3}{4}$ in., abdominal muscle good, slight separation of recti.	4	0	$1\frac{7}{8}$ to $2\frac{3}{8}$	4

No.	Name.	Age.	Pregnancy and Children and date of last child.	Disease, Condition, etc.	AC.	BC.	Aperture.	Ap.
*30.	E.K.	47.	P. 9, C. 8, 1890 ...	Prolapse. Girth 27 in., abdomen pouched, muscle not good, recti separated on raising head 1 in., pelvic floor lowered, anal cleft shallow, pubo-rectalis fairly good, ilio-coccygei very poor indeed, right kidney felt, not left; ring 11 years.	11	7	$1\frac{1}{2}$ to $2\frac{3}{8}$	7
				With ring out...	—	—	$1\frac{1}{2}$ to $2\frac{5}{8}$	9
*31.	L.O'C.	24.	P. 1, C. 0, 1907	Pregnant. Abdominal muscle pretty good, no separation of recti, girth $27\frac{3}{4}$ in., lower pole right kidney felt, not left.	8	2	$1\frac{3}{4}$ to $2\frac{3}{8}$	5
*32.	A.T.	33.	P. 2, C. 2, 1908 ...	Girth $29\frac{1}{2}$ in., abdominal muscle soft and yielding, very slight separation of recti.	5	4	2 to $2\frac{5}{8}$	5
*33.	L.H.	42.	P. 6, C. 6, 1904 ...	Retroversion. Pelvic floor muscle very good, pubo-rectalis in excellent condition.	8	4	$1\frac{1}{4}$ to $1\frac{5}{8}$	3
*34.	N.S.	17.	Nullipara	Hypertrophied right labium minus. Abdominal muscle good, no separation of recti, girth 27 in., lower pole right kidney felt on deep respiration, left not palpable.	9	4	$1\frac{1}{2}$ to $1\frac{7}{8}$	3
*35.	E.D.	30.	P. 2, C. 2, 1905 ...	Retroversion and erosion. Girth 31 in.	4	2	$1\frac{1}{2}$ to $1\frac{7}{8}$	3
*36.	M.L.	51.	P. 3, C. 3, 1887 ...	Girth 34 in., abdominal muscle good, on standing erect abdomen considerably pouched, pelvic floor feels as thought it has been considerably stretched.	5	3	$1\frac{3}{4}$ to $2\frac{7}{8}$	9
37.	S.R.	45.	P. 16, C. 15	——	—	—	2 to $3\frac{1}{8}$	9
*38.	L.P.		P. 1, C. 1	Pregnant 7 months. Girth $33\frac{1}{2}$ in., some separation of recti $1\frac{1}{4}$ in., anal cleft shallow, descent of whole pelvic floor, prolapse of posterior vaginal wall (strained very hard, with passage of flatus); muscle of pelvic floor in good condition, on straining it descends considerably.	7	6	$1\frac{7}{8}$ to 3	9
*39.	G.E.	22.	Primipara	Pregnant. Girth $33\frac{3}{4}$ in.	6	2	$1\frac{5}{8}$ to $2\frac{1}{8}$	4

The Inflammatory "Pelvic Mass."

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The genital tract in the female—the vagina, uterus and Fallopian tubes—may be considered as a cylinder, bifurcate in its upper portion, interposed between the external body surface and the peritoneal cavity. This bifid cylinder is patent throughout its length, and its upper extremities, the abdominal ostia of the tubes, are as open and unprotected as is the vulvar introitus below; throughout its course there is no obstacle, or even impediment, to any reciprocity between the external skin surface and the great mesothelial lymph space. Bacteria of all kinds, pathogenic or non-pathogenic, may track anywhere throughout its length, and through it find easy entrance to their great hunting-ground, the peritoneal cavity. Exposed so above and below, swung between unyielding bony walls, packed about with little resistant cellular tissue, and richly supplied with absorbent lymphatics, this genital cylinder undergoes always the periodic stress of menstruation, endures at times the strain of pregnancy and labour, and suffers the various traumata of child-birth or abortion. Gonorrhœal or pyogenic infection attack it not uncommonly from below, and tuberculosis from above. In consequence, viewed both from its anatomical disposition, and its many physiological vicissitudes, it, of necessity almost, is frequently, (too frequently it is true) the channel of ingress of acute peritoneal and systemic infection, and is itself very often the seat of local injury and disease.

It is solely with the local inflammatory disease of this genital cylinder that this paper proposes to deal; and only as this disease manifests itself in the upper portion of this cylinder, the portion above the pelvic floor—the uterus with its intra-ligamentous cellular tissue, the parametrium, and the Fallopian tubes. To these structures must be added the ovaries; for these latter organs, resistant as they are to infection usually become involved in the inflammatory process by reason of their close apposition and lymphatic supply. We speak, then, of inflammations of the uterus, its adnexa, and the pelvic cellular tissue, for it is any or all of these structures, when involved in an inflammatory process, which come to constitute the inflammatory "pelvic mass." In particular terms the inflammatory "pelvic mass" is a metritis, a salpingo-ovaritis or a cellulitis, single or combined, unilateral or bilateral, together with the attendant intraperitoneal adhesions and exudate. All degrees of the process

occur, from the unilateral small deposit, either cellulitic or tubo-ovarian, to the complete so-called "choked pelvis," where the viscera are no longer discrete or discernible and the pelvis appears as run full of plaster-of-Paris, occupied to the uttermost by a single, firm, undifferentiated mass. No matter the gradation of this process, the lesion constitutes itself as the inflammatory "mass." It is of the etiology of this "mass," its varieties, life history and treatment that I propose to speak.

Even as the poor, the inflammatory "mass" in the pelvis is always with us. It is extremely common, and a right understanding of its etiology, its exact recognition or diagnosis, and the wise method of treatment come to constitute no small part of the special knowledge of the abdomino-pelvic surgeon. Since the opening of the Royal Victoria Hospital in 1894, 4,200 cases have been treated to a conclusion in the Department of Gynæcology. Of this number, 832, roughly one-fifth of the total, have been instances of inflammatory disease of the uterus and its adnexa. This, I think, represents fairly the experience of every gynæcologist, that about one-fifth of his practice is concerned with inflammatory lesions of these viscera. Moreover, since, in the spread or extension of this disease, there is no boundary or dividing wall between the pelvis and the abdomen, this inflammatory mass may, and often does, invade the latter. The whole lower abdomen, and even the flanks, may be occupied.

The mechanism of this extension or spread is the formation of the reactionary zone, lymph adhesions and exudate thrown out to oppose the infective process. All viscera are levied into the service so as to form a retaining wall. If the initial focus be parametrial the main spread is always extraperitoneal, and the conflict is marked by the induration zone of cellular tissue. While if the lesion be visceral from the first, the struggle is chiefly waged within the peritoneum. The various viscera, first of the pelvis and then of the abdomen, become matted together. The omentum, the great peace-maker, is, as usual, quickly involved, and one after the other the successive coils of intestine. So the process extends, often at intervals quiescent, only to break forth anew; and its ultimate size is measured solely by two things—the extent and virulence of the infection and the individual's comparative resistance. So it varies from the small hen's egg mass, unilateral and entirely pelvic, to the large abdominal tumour. Though constituted in this way, when slow of formation its periphery may become so sharp and distinct, its whole contour so well defined that it not infrequently simulates a broad ligament or ovarian cyst.

Instances of diffuse spreading peritonitis with little or no local reaction or "walling off," which occasionally arise in the pelvis, are, of course, not included here; they give rise to no local mass.

As I have said, the inflammatory "pelvic mass" is primarily either

within or without the peritoneum, the site depending largely upon the nature of the infection.

Within the mass itself any stage of the inflammatory process may be discovered. Frequently it is only the initial stage of lymph exudate and œdema with round cell infiltration, as seen in the catarrhal salpingo-ovaritis, hydrosalpinx or cellulitic deposit. All stages of necrobiosis and tissue necrosis occur, and not infrequently there obtains surgical pus—the pyosalpinx, the tubo-ovarian or ovarian abscess or the extraperitoneal focus. Concerning the presence of pus, the temperature chart is human, and is therefore not infallible.

Such then is the actual entity, the inflammatory "pelvic mass." I shall now deal very shortly with its etiology and the clinical features of its three chief varieties.

Any systematic knowledge of inflammatory lesions in the pelvis goes back only some thirty years. Noeggerath's paper was published in 1872, but it was not until 1879 that Neisser isolated the gonococcus. Hegar's monograph on genital tuberculosis appeared in 1886, and though Döderlein published his classical paper in 1892, any exact information in regard to pyogenic infection of the pelvis practically begins with the present century. Only during the past dozen years have the flora of the healthy genital tract been described and classified. Numerous and exhaustive studies have recently been made, and the aggregate result is as follows:—Pathogenic organisms are frequently present in the lower segment of the genital tract. From the healthy vagina of pregnant women the streptococcus pyogenes, the staphylococcus, numerous diplococci, including the gonococcus and the bacillus coli communis, have been repeatedly recovered. While in every sense objectionable aliens, these organisms do not of necessity occasion disease, for the resistance of the healthy mucosa is great. They are, of course, in the parturient canal specially dangerous. When pathogenic they produce, each in its own way, the general and localized infections with which we are unfortunately so familiar. Such local infection is invariably the cause of the "pelvic mass,' for from the "mass" itself these same organisms can very often be recovered and cultivated. Not always so, it is true, as some, particularly the gonococcus, perish rapidly in their own toxins. The rule of their presence obtains, and their several varieties, their different behaviour, the methods of infection, the choice of the tissues and the resulting lesions; in a word, their pathogenic life history have been, and still are, the subjects of study. In this connection should be remembered always the researches of Menge, Kronig and Stoltz, and in our own country the work of Andrews, Hyde, Williams, MacDonald and Little.

Much remains to be done, but from our present day knowledge the following practical points may be gathered:—The organisms

that are chiefly pathogenic in the female genital tract are three, or they fall into three groups, Neisser's gonococcus, the streptococcus in its several varieties and the tubercle bacillus. The staphylococcus aureus, the bacillus coli and the pneumococcus, which are comparatively seldom found, and then usually in mixed infections, and the various saprophytes, which are relatively unimportant, may be for the time disregarded. I also shall not speak of the singular infections from bowel or blood-stream frequently found in senile conditions. There remain the three outstanding infections—the gonococcal, the streptococcal and the tuberculous. The first two invade the genitalia from below, and constitute the so-called ascending infection; while the last attacks from above, its primary pelvic focus being always the Fallopian tube, and is known as the descending infection. The unbroken genital mucosa of the healthy adult is attacked only by the gonococcus and the tubercle bacillus. A vaginitis in a woman otherwise healthy means always a gonorrhœa. Streptococcal infection occurs only in a canal damaged by child-birth or abortion or wounded by some trauma, either accidental or deliberate.

The host once invaded, their pathogenic life history begins. Each lives it in its own way. The gonococci prefer always the mucous membrane, spread by contiguity, do not penetrate very deeply, and so do not specially implicate the blood-vessels and lymphatics. From the vagina they enter the cervix, traverse the uterus, and finally reach the Fallopian tubes, where they flourish. A salpingitis results which almost invariably involves the ovary, the catarrhal salpingo-ovaritis of gonorrhœal origin, which is as a millstone hung about the neck. So it may persist more or less quiescent for years, a perpetual torment. Pus at any time may form, often a mixed infection, the pyosalpinx with indrawn fimbriæ, or the tubo-ovarian abscess. The lesion remains generally intraperitoneal and tends to become bilateral. With time the virulence of the organism becomes attenuated, and in purulent exudate it rapidly perishes.

The streptococci from their point of entrance neglect the mucosa and penetrate deeply from the first. Rapidly they implicate lymphatics and blood-vessels, and are swept therein. Their choice is always the loose vascular connective-tissue, and they find this in abundance in the parametrium. They multiply therein, and remain for the greater part extraperitoneal, the viscera being only secondarily involved, save the ovary which lies in the direct lymph channel. Pus may, or may not, form, and the inflammatory "mass" is commonly unilateral, and may remain pelvic or extend to the groin or flank. The virulence of the organism is extreme, though they lie for years quiescent.

The tubercle bacillus from some previous focus, frequently a caseating gland, drops in detritus to the pouch of Douglas. By the

lymph current it is swept into the Fallopian tube. Tubercle formation, a chronic salpingitis or a pyosalpinx with everted fimbriæ, even of enormous size, may develop. The condition is usually bilateral, is almost entirely intraperitoneal and the ovary frequently escapes. Though its life is long its virulence is not great. (I have purposely not spoken of the blood infection.)

Such, then, is the life history of these several organisms, and in their respective ways they so give rise to the inflammatory "pelvic mass." It is with this mass as a clinical entity that we now have to deal. Very fortunately for the clinician, these three infections often persist as they begin, separate and distinct, and behaving in a way peculiar to each, remain recognizable from beginning to end. All in common occasion the "inflammatory mass," but the "mass" of the one can clinically be distinguished from that of the other. Instances of cross-infection and hybrid growth, of course, occur; but these are the exception and not the rule. So in actual practice there emerge the three clinical varieties—the gonorrhœal, the streptococcal and the tuberculous, to name them in the order of their frequency and importance. I shall draw very broadly their distinguishing clinical characteristics:—

1. The gonorrhœal variety of the inflammatory "pelvic mass." A history of purulent leucorrhœa and previous urinary disturbance is sometimes of value. Pus in the urethra or vulvo-vaginal glands, or evidence of old inflammation for example, a skenitis or the *maculæ gonorrhoicæ* about the Bartholinian ducts are important; a Bartholinian cyst is pathognomonic, while a granular vaginitis or a catarrhal cervix may both occur. Such evidences may persist for years in untreated cases, and most cases are untreated, and their tale is unmistakable, a gonorrhœal infection has passed that way. Noeggerath's latent gonorrhœa leaves, of course, no such serpent's trail. The resulting "mass" is a salpingo-ovaritis, and may be of any size. It is frequently pelvic and not large; very often it is bilateral with the uterus recognizable between. Whether single or double these "masses" are commonly elastic, have a definite rounded contour and a boundary sulcus more or less distinct, which marks the lesion as visceral and intraperitoneal. To the bimanual examination, and this is the important point, the sense is that of a rounded or pyriform body with no complete indentification with the uterus or pelvic wall. The "masses" occupy the pouch of Douglas, and the uterus may not be greatly displaced. All degrees obtain; sometimes the landmarks are entirely obliterated, but the above is a common finding. The diagnosis is based upon the evidences of gonorrhœa below and the physical characters of the "pelvic mass."

2. The streptococcal variety of the inflammatory "pelvic mass." The history is valuable, and begins with child-birth or abortion, or some operative interference sometimes self-imposed. If acute, the

fever is high and the illness extreme. Pain is marked often down one leg, and that knee is flexed. Examination may, or may not, show an old gonorrhœa; if so, there is a mixed infection. The vagina is hot and dry, and the "pelvic mass" is usually unilateral, firm and discoid in shape with no limiting sulcus. Within the pelvis it gives the sense of set plaster-of-Paris firmly fixed to the pelvic wall. The uterus is often greatly displaced and the rectum compressed from before backward. The "mass" is of any size, and may project into the pelvis below or extend upward to the groin or flank. The uterine appendages may be indistinguishable, but frequently are swollen and sensitive. The diagnosis is based upon the history, and the recognition of the "mass" as extraperitoneal.

3. The tuberculous variety of the inflammatory "pelvic mass." Frequently the history is only of failing health and some menstrual depravity; this is the lesion of the young and unmarried. There is no evidence of gonorrhœa, though there may be cervical catarrh. The mass is cornucopia-shaped, and frequently bilateral, elastic, rounded and with definite contour. Pea-like nodosities may be found in the isthmian portion of the tube. The uterus is recognizable and not greatly displaced. The ovaries may be healthy and distinct. The diagnosis rests upon the history, absence of the evidence of gonorrhœa and the character of the elastic, fusiform, intraperitoneal "pelvic mass."

In all three cases the leucocyte count and cultures taken from the "mass" may be of distinct service; where tuberculosis is suspected the Von Pirquet reaction is often valuable.

The relative frequency of these different infections is fairly to be judged from my own practice. From 164 operative cases, 113 were gonorrhœal; 19 were tuberculous, 17 were streptococcal (12 puerperal and 5 non-puerperal) and 15 were of mixed infection. Here, as elsewhere, gonorrhœa far outnumbers all the rest put together.

Treatment of the "Inflammatory Mass."

Palliative treatment. During the past eight years I have treated 344 such cases. Of these 180, or more than half, escaped operation; palliative and hygienic treatment gave fair results. Of this palliative treatment rest is the great factor, and rest in bed; and youth and individual resistance determine the result. The nature of the infection or the size of the "mass" is here no contra-indication, for nature may work pelvic miracles. Witness the three following cases: —

1. Girl of 18, patient to Dr. Evans, gonorrhœal "choked pelvis," with the crest of the "mass" nearly to the umbilicus. Palliative treatment gave, in a year, a pelvis normal to palpation. The girl subsequently married, and was safely delivered of a child.

2. A woman of 28, tuberculous salpingitis. Four years ago both tubes swollen to the size of the index finger, and were nodular and

sensitive. Steady improvement followed rest out of doors. For a year she has resumed her ordinary life, her menstrual habit has been restored, and the tubes are now normal in size, though slightly fibrous and nodular.

3. Woman of 35, with a large left-sided, extraperitoneal "mass" in the pelvis reaching to the iliac crest. The whole left half of the pelvis was occupied, and the uterus was pushed far to the right. The patient was bedridden, complained of sciatic pains, and the left leg was flexed and wasted. She gave the history of puerperal infection the year before; this was probably streptococcal, as the illness was acute for three months, though there was no abscess formation. Under palliative treatment which included hot air baths, massage and electricity, the condition rapidly improved. A year later all functions were restored, and the patient was active and about the house, though there was still a small "mass" in the pelvis.

Operative treatment. Here I have followed always the technique established by Dr. Gardner, the Chief of the Department. In eight years I have operated upon 164 cases of the inflammatory "pelvic mass" with three deaths—a mortality of 1·8 per cent. In all these cases the recognition of the nature of the infection and the method and time of interference are all-important. Upon these things everything depends. If the infection be streptococcal it is never safe to open the abdomen, as the organisms are persistently virulent. Moreover, the main "mass" here is always extraperitoneal, and consequently irremovable, and even if the diseased uterus or its appendages be extirpated the chief lesion is still beyond surgical help. A cœliotomy in such a case is absolutely futile and extremely dangerous. It should never be performed, as a streptococcal peritonitis is almost inevitable. Yet such an operation, even as other surgical blunders, is not so rare. I have performed it twice myself; and the result was, in one, a death, and in the other a protracted and stormy convalescence. Crossen, of St. Louis, tabulates a series of 23 such cases, where, after a cœliotomy, 5 died; a mortality of nearly 22 per cent. In all these cases then the abdomen should remain unopened; surgical interference should only seek to establish drainage, to evacuate abscess cavities as they form, and the methods should be always extraperitoneal, either a colpotomy below or above the groin or a flank incision. Mixed infections, either gonorrhœal or tuberculous, if they occur here, must wait. Sixteen such cases I have treated in this way without a death. One, a puerperal case, lay in hospital six months and required four successive incisions; while another, infected from the careless use of a sponge-tent, became convalescent only after three operations for drainage. The great difficulty is always to recognize the condition. Yet in most instances its personality is plain, and to be forewarned of it is to make few mistakes.

In the gonorrhœal "pelvic mass" all surgical interference is contra-indicated during the acute stage. A cœliotomy at this time incurs heavy additional risk, and in waiting there is no harm. The exacerbation sooner or later burns itself out as the organisms perish. Posterior colpotomy with complete tunnelling of the "pelvic mass" is a wise, curative and conservative measure, and should, I think, be even more frequently undertaken. Extirpation of the diseased organs should only be made as a last resource.

With the tuberculous "pelvic mass" the converse obtains. If the lesion is progressive the sooner it is removed the better. Posterior colpotomy has here no place. Extirpation is the only cure.

TECHNICAL MEMORANDA.

On a Suprapubic Transverse Fascial Incision in Gynæcological Cœliotomy.*

By JOHN A. KYNOCH, M.B., F.R.C.S. (Ed.),
Professor of Obstetrics and Gynæcology, University of St. Andrews.

SOME years ago one of the most frequently discussed gynæcological subjects was abdominal versus vaginal cœliotomy. In a paper which I read before this Society on the latter operation the general opinion expressed was that, although vaginal cœliotomy had the advantage over the abdominal route in the avoidance of a scar with the possibility of a subsequent hernia, yet the limited space to work in more than counterbalanced the advantage in favour of the abdominal route. The linea alba, although the weakest part of the abdominal wall to support the abdominal viscera, is still the favourite line of incision, doubtless on account of its sparse vascular and nerve supply. Many express themselves as being quite satisfied with the results. Howard Kelly, for example, says he has used the ordinary median abdominal incision through the linea alba in over 2,000 cœliotomies, and has no reason to distrust it on the ground advocated by some surgeons that the cicatricial union is less firm and secure than in those cases where the incision is lateral to the median line. Doubtless, with the improved technique in the preparation of the suture material, and in the manner of closing the wound, the number of cases of hernia following incision through the linea alba has greatly diminished. Abel, at the International Gynæcological Congress, held in Vienna in 1895, stated that in following up the after results of cases where through and through sutures had been employed, he found that the number of cases of hernia was 30 per cent. On the other hand, the percentage had fallen to 8 per cent. in cases where the suturing in layers had been used. To improve upon those figures other operators have employed an extra median incision along the linea semilunaris. But Mickuliez has shown that such an incision, dividing as it may the terminal branches of intercostal nerves, may result in paralysis and atrophy of the corresponding rectus muscle—a condition favouring the development of subsequent hernia.

*Communicated to the Edinburgh Obstetrical Society, Wednesday, May 11 1910.

For an efficient cicatrix, fascia, weakened by incision, should be supported by intact muscle, and such a cicatrix must permit of freedom of movement of each separate layer of the parietes. Such requirements demand care in the method of *opening* the abdomen. To meet those demands Lenander, in 1893, divided the anterior sheath of the rectus, which was pushed aside so as to permit of the posterior sheath and peritoneum being opened. By restoring the rectus to its original position and leaving the linea alba intact, direct muscular support was thereby given to the anterior fascial cicatrix. This incision has been advocated and carried out by Wallace, of Liverpool, who reports excellent results from this method. In 1896 Rappin, of Lausanne, reported, at the Geneva Gynæcological Congress, that he had used a transverse incision corresponding in direction to the natural folds of the skin above the symphysis pubis. About the same time Küstner advocated a similar transverse incision through the skin and subcutaneous tissues exposing the fascial layer, which was incised along with the other layers in a vertical direction. Both Rappin and Küstner suggested this incision merely for cosmetic purposes, the transverse cicatrix appearing as a white line frequently covered with pubic hair. Neither of them claimed for this incision any protection against subsequent hernia. Lange has shown that the skin fibres of the anterior abdominal wall run a course chiefly transverse in direction. When those fibres are divided at right angles, as they must be in all vertical incisions, their retraction leads to gaping of the wound, and the resulting cicatrix must tend to broaden. On the other hand, a transverse skin incision leads to very slight gaping of the wound, and the cicatrix resulting tends to broaden to a much less extent. Pfannenstiel, taking advantage of this anatomical fact, adopted a modification of Küstner's incision, in that he divided the anterior sheath of both recti muscles transversely. Pfannenstiel proceeded as follows:—About 6 cm. above the pubes a slightly curved transverse incision, 6–8 cm. long, was made through skin, sub-cutaneous tissues and anterior sheath of both recti muscles. The anterior sheaths were then bluntly dissected up from their attachments to the recti muscles. The attachment to the linea alba, which now appeared as a prominent ridge, was divided with scissors. The linea alba was then divided vertically and the abdomen opened in the usual way. In closing the wound the peritoneum, recti, fascia and skin layers were united with continuous sutures, although latterly Pfannenstiel closed the skin and fascial layer by a figure-of-8 silkworm gut suture. The result of such an incision is that the transverse fascial wound is protected by intact muscle. By this incision the conditions for an efficient cicactrix are fulfilled. The dragging asunder influence of the skin and muscular fibres is avoided so that the edges of the skin and fascial layer fall naturally together, a fine linear almost imperceptible cicatrix resulting. It has the

advantage over extra-median incisions that no nerves are divided, and consequently no muscular atrophy can occur, so that unimpaired muscle protects the divided fascia. A hernia is only possible at one point, namely, where the fascial transverse incision is crossed by the vertical incision between the recti; and this can, in great part, be avoided by suturing together the muscles at this point. In employing this method of opening the abdomen it is essential that every bleeding vessel should be most carefully ligatured, forci-pressure not being sufficiently reliable to prevent the formation of a subfascial or subcutaneous hæmatoma—cases of which have been reported where this precaution has not been employed. As a further precaution against oozing Pfannenstiel recommended the application of a flat sandbag, varying in weight from 6–9 lbs., to be applied over the dressings for a period of 12 to 24 hours.

The advantages claimed for a transverse fascial incision are:—

1. Chiefly, the avoidance of post-operative hernia. The reports of Pfannenstiel, Döderlein, Menge and others are very favourable regarding the absence of subsequent hernia.

2. The field of operation, especially the lateral and anterior part of the pelvis, is very accessible. This is due to the low position of the incision and to the muscles being separated from the anterior sheath, which permits of their being widely drawn asunder by retractors. As Döderlein has said, the muscles are now like "weiche gummibänder."

3. Patients can rise sooner than when the ordinary vertical incision is employed, as the intra-abdominal pressure does not, to any extent, effect the skin and fascial incision. In elderly patients with a tendency to hypostatic congestion of the lungs it is advantageous to sit up on the third or fourth day after operation.

4. It is unnecessary for patients to wear abdominal belts after operation.

Pfannenstiel at first limited the indications to cases which, previous to his incision, were favourable for vaginal cœliotomy—an operation he thought it might to a great extent displace. Such cases are ovarian cysts of moderate size, non-suppurative disease of the appendages, small fibroid tumours, ventro-fixation of the uterus and the early stages of ectopic pregnancy. Cases suspected to be infective are unsuitable.

For the past five years I have employed Pfannenstiel's incision in the above class of cases, having seen it first carried out in his klinik in Giessen. With few exceptions, it is the method of opening the abdomen most frequently employed in German gynæcological kliniks, and in many it is not limited to the cases already mentioned, but is used in the removal of very large pelveo-abdominal tumours. I have deviated a little from Pfannenstiel's description, in so far as I endeavour to avoid wounding the linea alba by separating one or

other recti muscle from its edge, then drawing it externally so as to permit of the peritoneum being opened, the displaced rectus being then fixed by a suture to the linea alba.

In 20 cases that I have been able to follow up for a period of at least two years after operation the results have been so satisfactory that I consider this method of opening the abdomen in suitable cases an improvement on the usual vertical incision through the linea alba.

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REVIEWS OF CURRENT LITERATURE.

UNDER CHARGE OF EARDLEY HOLLAND, M.D.

LIST OF COLLABORATORS:

LONDON. Alban Doran, F.R.C.S.; J. J. Macan, M.D.; J. B. Banister, M.D.; J. Barris, M.B.; B. Glendining, M.D.; A. L. H. Smith, M.B.; F. E. Taylor, M.D.; C. White, M.D.; J. A. Willett, M.D.

EDINBURGH. E. Scott Carmichael, M.B.; Miss J. H. Filshill; R. W. Johnstone, M.D.

GLASGOW. E. H. L. Oliphant, M.D.

SHEFFIELD. Miles H. Phillips, M.B.

CHELTENHAM. C. J. N. Longridge, M.D.

Imperforate Hymen in Two Sisters.

W. B. MAYNE (*Lancet*, 1910, Vol. i, p. 1619).

CASE 1. Girl, aged 19. Had never menstruated. Had hæmatocolpos, size of a four months' pregnancy. Hymen incised, hæmatocolpos drained. Recovery.

CASE 2. Sister, aged 16. Had never menstruated. Hymen incised. No hæmatocolpos. F. E. T.

Prolapse of the Urethra Secondary to Phlebitis of the Meatal Veins.

MORRESTIN (*Ann. de Gyn. et d'Obstét.*, June 1910) points out how frequently varices are present in the meatus of the female bladder, and suggests that thrombosis of these veins comparable to that occurring in hæmorrhoids will explain some cases of obscure urinary troubles in women about the time of the menopause. He quotes a case where a patient had increasing dysuria with some blood-stained vaginal discharge. On examination a dark-red mass, comparable in every way with inflamed hæmorrhoids, was found around the orifice of the urethra. The mass was apparently strangulated, and was beginning to slough. No cystitis was present, and the pelvic viscera were normal. Under fomentations the swelling decreased, and was subsequently removed by a kind of Whitehead operation. C. W.

Patent Urachus Opening up in Pregnancy.

TODD, of Adelaide, South Australia (*Brit. Med. Journ.*, July 2 1910) reports a case of diverticulum of the upper part of the bladder with a patent urachus. The patient was thirty-three, troubled with dysuria and umbilical hernia; the urine was alkaline and contained pus. She had borne two children. The dysuria began four years before she came under observation, during her first pregnancy, when, for a time, most of her urine was passed through the umbilicus. (This case resembles another reported by Unterberger, *Monatsschr. f. Geb. u. Gyn.*, Vol. xi, 1900, p. 657.—*Rep.*) After delivery urine was passed through the urethra, but the dysuria increased steadily in severity. Coe was able to pass a sound through the urethra and bladder upwards to the umbilical scar. He dissected away the whole urachus, which was attached below to a large diverticulum running upwards from the apex of the bladder; this also was removed, and the opening in the bladder, two inches and a half in length, closed with a double row of catgut sutures. The bladder symptoms disappeared entirely. A. D.

Single Uterus with Double Cervical Canal.

Piquand and Bitte (*Bulletins et mém. de la Soc. Anat. de Paris*, April 1910) describe a case recently under Reclus. A woman, aged 34, was admitted into hospital for leucorrhœa with hypogastric and pelvic pain. The periods were normal, but pregnancy had never continued to term, and three miscarriages had occurred, all before the end of the fifth month. Through the speculum a septum was detected in the upper part of the vagina. It ran from before backwards, and from left to right; its upper border touched the cervix, but was not attached to it. Most probably they had originally been connected, as a groove corresponding to the border of the septum ran over the surface of the cervix, the groove was very oblique in its course, and on each side lay an os externum, the right anterior to the left. After dilatation a sound was passed into each os, and it could be made to touch the other sound in the uterine cavity. Thus there were two cervical canals separated by a wedge-shaped piece of cervical tissue with the apex at the os internum, which was single, and the base over 9 millimetres broad on the free vaginal surface of the cervix separating the right and left os externum. Vertically, the wedge measured 25 millimetres, or nearly an inch in length. It was excised, and but little hæmorrhage followed; its mucosa, lining the inner portion of the right and left cervical canal, bore plicæ. The endometrium was healthy and the uterine cavity normal, neither bifid nor septate.

A. D.

Hernia of Uterus in Men and Women.

J. Bland-Sutton (*Brit. Med. Journ.*, 1909, Vol. ii, p. 1265) states that the sac of an inguinal hernia in female infants often contains some of the internal genitalia, usually the ovary, occasionally the tube and ovary. Exceptionally the tube, ovary and the greater part of the uterus occupy the sac. They may become strangulated, or undergo axial rotation, and lead to acute symptoms demanding urgent surgical treatment. In adult women it is exceptional to find internal genitalia in inguinal sacs, but hysteroceles do occur at all ages, more than fifty having been recorded. In the majority of these cases the finding of the uterus with one or both appendages in the hernial sac has been a surprise during an operation for irreducible or strangulated hernia. In many cases the uterus was of normal size, in some cases it was smaller than normal and occasionally malformed. A uterus occupying the sac of an inguinal hernia has become gravid, the fœtus being extracted by Cæsarean section.

Twenty years ago, while dissecting a male fœtus, Bland-Sutton found a uterus (corresponding in shape and size to that of a female fœtus of the same age) behind the bladder communicating, by means of a small vagina, with the urethra in the position of the sinus pocularis. Each Fallopian tube passed from the uterus as a mere thread and then expanded into a fringed ampulla which entered the inguinal canal and joined the testis. Stonham operated for congenital inguinal hernia in a similar case in a boy, aged 9 months. Inguinal hysterectomy has been performed on men by Brossard, Arnolds and Keiffer.

F. E. T.

Rut, Ovulation and Menstruation.

Pottet (*Ann. de Gyn. et d'Obstét.*, June 1910) gives an interesting summary of the work which Regaud and Dubreuil have published since 1907 on these subjects.

Rut. It has generally been believed that rut and menstruation (its representative in women) are dependent on the internal secretion of the corpus luteum (Fränkel, Villemin), but the authors point out that this theory cannot be applied to the rabbit. Their observations rest on the fact that a rabbit only accepts the male during the rutting period, and this is the only certain sign that rut is present. If the Fränkel-Villemin theory were true one should find well-formed corpora lutea in rabbits soon after coitus (*i.e.*, when rut is present), but when examined, 7 hours after coitus, the

follicles are still intact, and no corpora lutea are present. The follicles rupture 7–10 hours after coitus, and in the next few days young corpora lutea may be found. Thus the presence of corpora lutea does not coincide with the time of the rut and does not cause the acceptance of the male in rabbits.

They have investigated the influence of the interstitial gland of the ovary in producing rut, but admit that in apparently normal rabbits the appearances of the gland vary so much that exact observations are difficult to make.

In 16 rabbits examined soon after the rutting period, it was well developed 5 times, and feebly developed 11 times—it would thus appear to have no direct influence on the rutting period.

Lataste stated that sexual phenomena were rhythmic in the females of many rodents, and that the rhythm was one of 30 days; Regaud and Dubreuil have shown that it is influenced by the presence of the male; thus (1) rabbits living entirely separated from the male have rutting seasons at irregular times; but (2) when living with a male they are, in the great majority of cases, covered each 30 days. This was shown experimentally by putting 5 rabbits with the male for a short time daily—no rut for 18 days, but of 5 others put with the male for 12 days, 3 were covered by the male.

Ovulation. The first point discussed is whether ovulation is spontaneous. In rabbits probably it is not, because (1) if a female rabbit has coitus during the rutting time several hours elapse before the follicles rupture; (2) if coitus is prevented, follicles are rarely found ruptured, even after several days of rut.

Villemin says that spontaneous ovulation is shown by the presence of corpora lutea in the ovaries of rabbits which have been kept separate from the male for a prolonged period; but Regaud and Dubreuil deny this, as in 9 rabbits isolated for 7 weeks they only found faint traces of lutein substance in two.

Their views may be summarized thus:—

An isolated female rabbit: no ovulation.

In the vicinity of the male, but without contact: no ovulation.

In contact with male, but without coitus: ovulation rare.

In contact with male, and with coitus: ovulation usual.

In women they think ovulation is probably spontaneous, but may be influenced by sexual excitement.

Menstruation. According to Ancel and Villemin the Graffian follicle bursts neither at the time of menstruation nor immediately before nor after, but 12—14 days before its onset. The corpus luteum formed from the burst follicle reaches its maximum about 2—4 days before menstruation starts, and therefore it is the internal secretion of the corpus luteum which causes menstruation to start. Also corpora lutea only form between puberty and the menopause, and this is the time when menstruation takes place.

Regaud and Debreuil say that Graaffian follicles only ripen after puberty, and that the bursting of the follicle may just as well occasion the menstruation. Mandl's case is quoted, in which a girl was operated on the day before the menstrual period was due to start. The uterine mucous membrane showed premenstrual changes, and the ovary contained a large follicle ready to rupture, but no trace of corpus luteum. They conclude that Fränkel's theory that in women menstruation is caused by the activity of the corpus luteum, is without proof. They give details of their experimental work, but state that this is built on the very debatable theory that menstruation corresponds with rut in animals. In structure the corpus luteum does not vary much in different animals, and therefore if it is the cause of menstruation or rut in one animal it ought to be in all; but—in woman it is said to be caused by the fully-developed corpus luteum (Ancel and Bouin)—in dogs it is at the beginning of its

growth—and in the cat and rabbit ovulation actually occurs after, and has no influence on the rut of the animal. These facts are difficult to fit in with any theory that connects the corpus luteum with rut. C. W.

The Menopause, Natural and Artificial.

A. E. Giles (*Lancet*, 1910, Vol. i, p. 430), considering the normal menopause, insists (1) that a recurring increase of the menstrual flow is not a normal sign of the menopause, and (2) that the menopause itself is not the cause of disease of any kind. He also considers that the artificial menopause differs from the natural in that the cessation of ovarian activity is brought about suddenly instead of gradually, and consequently the resulting symptoms are more marked.

Moral treatment is not unimportant. Ammonium bromide in 10 grain doses, thrice daily, checks flushes and allays nervous irritability. In some cases of artificial menopause ovarian extract in 5 grain doses, twice or thrice daily, is useful.

F. E. T.

Menstrual Disorders.

Dalché, of the Pitié Hospital (*La Gynécologie*, May 1910) prints an article from Robin's system of therapeutics, which is in the press. The recommendations, for the most part, are in somewhat general terms, and refer largely to the disturbances of organs other than the pelvic ones. He advises the interruption of cold baths during the periods though some women use them without inconvenience. For the menstrual *migraine* he recommends thyroid extract and ovarian extract, separately or combined, as also for various other pains. Similarly for the aggravation during menstruation of the pains of floating kidney suprarenal opotherapy is indicated. For the palpitations of the menopause pituitary and ovarian extracts are recommended.

E. H. L. O.

Anæsthesia of the Pudic Nerve.

W. Ilmer, Klagenfurt (*Zentralb. f. Gyn.*, 1910, No. 21) recommends anæsthetizing the pudic nerve, as described by W. B. Müller in his Narcology, for operations for lacerations of the perineum, for prolapse, for piles, and for wounds of the labia. He injects 1 ccm. of a 5 per cent. solution of cocain diluted with 5–6 ccm. of sterile physiological salt solution. This is merely a modification of Schleich's local anæsthesia, but the administration of 0·05 cocain, the whole of which may be absorbed, seems somewhat hazardous.

Sellheim (*ibid*, No. 27), referring to the above article, says that anæsthetization of the pudic nerve has been tested in the Tübingen Frauenklinik in cases of various kinds; in the relief of slight and extensive prolapse and in operating upon complete laceration of the perineum of long standing; in midwifery it has been employed to diminish suffering in spontaneous delivery, during laceration of the perineum, for perineovaginal incisions, and for the application of forceps and extraction. The nerve passes through the lesser aschial foramen into the ischiorectal fossa, the inner side of which is indicated by the ischial spine. The point of the thumb of the hand corresponding to the side to be anæsthetized, marks the point of entrance for the needle, a little to the side of the tuberosity, and in the vagina the middle finger of the same hand is kept on the ischial spine, while the index is free to control and guide the point of the needle. It is undesirable that the needle point should absolutely enter the foramen, and Sellheim recommends dividing the solution into several portions at different depths: he colours the solution blue so as to be able, if necessary, to know its whereabouts during operation. If complete anæsthesia was not obtained after 15 minutes the injection was repeated; as a rule, one sufficed, more than two were never necessary. He met with no ill-effects. J. J. M.

Capillary Drainage.

Sippel, Frankfort (*Zentralb. f. Gyn.*, 1910, No. 24), was obliged to operate for vital indications upon a woman 39 years of age, with myoma of the corpus uteri, pyo-salpinx, and an ovarian tumour, on account of diffuse peritonitis. He plugged the pouch of Douglas with gauze in Mikulicz's way and also inserted in front of the gauze a firm drainage tube passing from the abdominal wound through the pelvis into the vagina. Yet all the secretion was discharged, contrary to gravity, through the tampon drain and not through the tube. This is an example of the efficacy of capillary drainage; care must however be taken that this is not impeded by compression, and this is best prevented by inserting a firm tube alongside the gauze.

Capillary drainage has two drawbacks: it is difficult to remove, and increases the danger of hernia. The difficulty of removal is lessened if one defers it till the 6th or 7th day and if while drawing out the gauze one pours over it a 2 per cent. solution of hydrogen peroxide. J. J. M.

Ossifying Fibromyoma Invaded by Carcinoma Corporis Uteri.

Bryden Glendining (*Archives of the Middlesex Hospital*, Vol. xix, 1910) includes, in the Ninth Cancer Report of the Middlesex Hospital, an instance of an unusual complication of carcinoma and fibromyoma, the latter growth showing a rare change. A uterus enlarged to about three times the normal size, but not much altered in form, was removed by Mr. Bland-Sutton. The walls were increased in thickness, a small fibro-myoma lay in the stump of the right round ligament, and a fibroid polypus as big as a pigeon's egg was attached to the inner surface of the uterus at the fundus by a stout but short pedicle. The lining membrane of the uterus, posteriorly and to the left, was covered with a shaggy papillomatous growth, whilst the anterior and right lateral portion of the endometrium was smooth and healthy. The posterior surface of the polypus was covered with the shaggy growth. The papillomatous uterine tumour was soft, lacerable and white, solid throughout and proved, when examined under the microscope, to be a columnar-celled carcinoma replacing entirely the endometrium and invading the muscular coat to a slight depth. The polypus was gritty when cut. Under the microscope sections of the fibroid polypus were found to include areas of true cancellous bone, of columnar-celled carcinoma of the typical fibromyomatous tissue seen in uterine "fibroids." The first and second new growths were scattered over the fibromyomatous matrix in distinct areas and in about equal proportion. The carcinoma was similar to that which grew from the uterine wall. It was detected at some points in the meshwork of the cancellous tissue, but for the most part the bony and cancerous patches lay side by side. A. D.

Post-peritoneal Hæmatocele Complicating a Uterine Fibroid.

W. Alexander (*Lancet*, 1910, Vol. i, p. 643) performed laparotomy in a single lady aged 50 for an abdominal tumour supposed to be a solid ovarian. It was found to be a uterine fibroid weighing 12 lbs. after removal. A diffused mass consisting of a dark layer of blood was seen extending over the front of the spinal column and between the layers of the meso-colon as far up as the hilum of the liver. The broad ligaments did not contain blood when the hæmatocele was discovered, but they gradually filled up with blood from above. A drainage tube was inserted and the abdomen was closed. The patient recovered. F. E. T.

Ovarian Grafting.

Scheurer, *Bagnoles-de-l'Orne* (*La Gynécologie*, May 1910), contributes a paper on this subject, and gives a summary of the work hitherto done on women and lower

animals. He adopts the Italian terminology, using the term *autograft* for a transplatantion of an ovary in the same animal, *homograft* for a transplantation from another animal of the same species, and *heterograft* for one taken from an animal of a different species. He has been able to find only two reports of the microscopic examination of ovaries transplanted in women and now adds a third from his own experience. This ovary had been fixed in the subcutaneous cellular tissue of the abdominal wall by Prof. Tuffier, but the patient complained so much of pain and swelling at the site of implantation that the organ was removed. Scheurer gives drawings of various parts of the ovary with drawings of similar parts of a normal ovary preserved for two days by cold-storage, and he finds it difficult to say whether the organ is in a beginning phase of degeneration or in a state of suspended animation, but it is at least alive. He gives the results of twenty-two cases observed in Tuffier's wards and concludes that the ovary can be grafted and survive and that in some cases it wards off the symptoms of premature menopause. If it be admitted that only ten per cent., at most, of women escape these troublesome symptoms after ablation of both ovaries, and if experience shows that 50 per cent. escape after the grafting of an ovary, then the operation is indicated. If it should turn out that the human ovary can be successfully grafted after cold storage for a fortnight one of the difficulties of the technique will be abolished. E. H. L. O.

Autoplastic and Heteroplastic Transplantation of the Ovaries.

Higuchi, of Tokyo (*Archiv f. Gynäk.*, Vol. xci, Pt. 1, p. 214), reviews this subject as treated by recent authorities and reports his own conclusions based principally on experiments on rabbits. He examined subjects where autoplastic transplantation had been practised, one year after the operation, and found that the grafting usually succeeded and that the ovaries retained their functions. Their essential elements remained perfect, yet they themselves often diminished in bulk. Hyperplasia of the endometrium and its glands, with simultaneous atrophy of the muscular coat of the uterine horns on the serous side, with a less degree of hyperplasia of the mucosa of the Fallopian tubes and vagina were the rule in this series. On the other hand Higuchi changed ovaries between a pair of female rabbits, and after several experiments of this kind found that these heteroplastic grafts, inspected after the same space of time as the former autoplastic series, showed invariably either very marked degenerative changes or else complete atrophy, the organ having almost disappeared. The elements of the cornua uteri all underwent atrophy, the surrounding connective tissue and tubes sharing in the process. The vagina and, it is interesting to find, the cervix uteri were slower in becoming atrophied. Lastly, ovaries transplanted to males became completely absorbed. A. D.

Spontaneous Rupture of an Ovarian Cyst.

R. Jones and W. M. Eccles (*Lancet*, 1910, Vol. i, p. 429).—A trained nurse, aged 34, was suddenly seized with pain in the lower abdomen whilst turning over in bed. The pain continued during the day and vomiting of stomach contents occurred. The patient became collapsed, presented an abdominal facies, and the respirations were shallow and thoracic : the pulse was quick, weak and compressible and the temperature was subnormal. The liver dulness was apparently diminished and there was no swelling in the right iliac fossa. The diagnosis rested between perforated gastric ulcer, appendicitis, and ruptured ovarian cyst. Laparotomy was performed through a median incision above the umbilicus and the stomach explored. This was negative, a little glairy fluid and no gas escaping. A second median nicision was now made just above the pubes. A collapsed ovarian cyst springing from the left ovary was found and removed. The patient recovered. F. E. T.

Double Dermoid Cyst of Ovaries with Rupture into the Peritoneal Cavity.

R. H. Lucy (*Lancet*, 1910, Vol. i, p. 1756) performed cœliotomy for a dermoid cyst of the ovary in a single woman aged 32. The peritoneal cavity was filled with primrose-yellow material resembling lanoline, of which eleven pounds by weight were removed by handfuls. Similar material exuded from an orifice in a cyst of the left ovary which was removed. A dermoid cyst of the left ovary about the size of a fœtal head was also removed. The whole of the parietal peritoneum was covered with a thick layer of sebum. The peritoneum was closed, with drainage. Continuous saline proctolysis was employed. Recovery ensued.

Lucy raises the question whether this case should be regarded as an instance of "epithelial infection," or as a "malignant embryoma." F. E. T.

Transplanted Ovarian Dermoid Removed during the Puerperium.

F. Ivens (*Lancet*, 1909, Vol. ii, p. 1206).—A woman, aged 40, was sent to hospital when five months advanced in her twelfth pregnancy with a painful tumour the size of a fœtal head in the right iliac fossa. It was considered to be a sub-peritoneal fibroid. At the seventh month the pain increased, but subsided after a few days' rest in bed.

Labour occurred spaontaneously at her eighth month and was unduly prolonged, being an occipito-posterior presentation. The child died in 24 hours. Laparotomy was performed on the thirteenth day of the puerperium. The omentum was spread over a dermoid tumour of the size of a fœtal head extending from the right iliac fossa towards the pelvis. The tumour was fixed by a broad base on to the anterior surface of the right broad ligament, and was markedly adherent. A stump consisting of ¾ in. of the left tube remained attached to the uterus, the free end being pervious. A scar indicated the former position of the left ovary, the infundibulo-pelvic and ovarian ligaments. The right tube and ovary were normal. The patient recovered. F. E. T.

Fat Embolism after Ovariotomy.

Praeger, Chemnitz (*Muenchener m. Wchns.*, 1910, No. 20, S. 1092), recently reported to the local medical society the following case:—A woman, of 44, whose physical condition showed that she had had pleurisy, but who had only been treated by a quack for gastric trouble (Christmas 1908 to Easter 1909) underwent a severe ovariotomy for a large papillary pseudomucinous cystadenoma broadly adherent to the anterior abdominal wall; on the fourth day after the operation vascular symptoms and icterus appeared, and she declined nourishment and became extremely restless. Coma supervened the next day with hyperæsthesia of the skin of the abdomen and limbs, involuntary spasms of the facial muscles, and risus sardonicus. The cause of the vascular trouble was ascertained to be fat embolism which declared itself on the fifth day after operation by much fat in the urine; on the seventh day fat was found in the blood also. The vascular symptoms declined after 48 hours, but on the seventh day after the operation the inflammation of the right pleura flared up again with considerable effusion. The excretion of fat in the urine persisted till the 14th day. The wound healed perfectly. The patient was discharged on the 27th day after the operation, and five weeks later the pleuritic exsudate was completely absorbed, though there was still some friction sound under the right scapula.

Praeger discussed the pathology of fat embolism, recorded not unfrequently in surgery or orthopædic cases in literature. He had not found any similar case after an abdominal operation. In his own case he attributed the embolism to the crushing of the very fat abdominal walls during the forcible extraction of the large ovarian tumour. J. J. M.

Primary Cancer of Fallopian Tube: no Recurrence Five Years After Operation.

BENTHIN, of Kiel (*Archiv f. Gynäk.*, 1909, Vol. lxxxvii, p. 221), reports a case under Pfannenstiel in 1902. The patient was a healthy woman aged forty. She had only once been confined, and that was at the age of 22. Puerperium was normal and she had never had a bad illness, nor been troubled with leucorrhœa. The menstrual blood had been fœtid for two or three years. For six months the patient had suffered from pain in the umbilical region, running down lower towards the right. A free brown discharge before and after each period, which appeared with perfect regularity, was noted for a full year before she was admitted into hospital. The uterus was found to be pushed to the left and backwards by a tense cyst under which a tough enlarged ovary could be defined. The cyst was believed to be parovarian. The curette was applied, and the cyst then removed by anterior colpotomy. It was found to be a malignant papilloma of the right Fallopian tube, of the size of a fist; there was a metastatic deposit on the right ovary. On that account abdominal hysterectomy was performed on the fourteenth day, the uterus was amputated above the cervix and the left appendages also removed; they proved to be free from disease. Five years later the patient was examined and found to be in perfect health. The stump of the cervix was freely movable, the scars in the vagina and abdominal wall quite sound and there were no enlarged pelvic glands nor any evidence of more distant metastases. A. D.

Unruptured Tubal Pregnancy of Thirteen Months Duration.

J. MORRIS (*Lancet*, 1910, Vol, i, p. 1469).—A married woman, aged 34, was admitted to hospital in Buenos Aires complaining of an abdominal tumour, attributed by the patient "to a baby three months over time." Menstruation ceased in September, 1908. In the following March quickening was first felt. Swelling of the abdomen increased, and movements persisted until June when labour was expected. Patient then had a "show" of blood with bearing down pains. Laparatomy was performed on October 21st. A much adherent gestation sac was exposed and incised and a fully developed dead male child weighing $5\frac{3}{4}$ lbs. was removed, the cord, which was completely thrombosed, being cut. The sac, which was situated behind the uterus, was then freed from adhesions and removed. It consisted of the dilated and unruptured right Fallopian tube with walls on an average $^3/_{16}$ths of an inch in thickness. The placenta was situated upon the posterior wall. F. E. T.

Transfusion of Blood during Pregnancy.

DELMAS, Montpellier (*L'Obstétrique*, May 1910) relates the results of his experiments on various pregnant animals. Direct transfusion of blood was performed by Denis, of Montpellier, in 1667, but lack of success must be attributed to absence of aseptic methods. Injection of defibrinated blood has been followed by death from the formation of clots. The only feasible methods are the direct transfusion from artery to vein or the injection of corpuscles obtained by centrifugalizing and repeated washings in artificial saline serum. This last method has been used by Fleig to wash and re-inject a patient's own blood, but Delmas wished to try the effect of blood injections on the course of pregnancy and on the viability of the fœtus. In the direct transfusion he employs Fleig's modification of Payr's tube. In Payr's tube the artery of the giver is pushed through the canula and turned back (everted) over its point, which is thrust into the vein of the recipient. Fleig makes use of a piece of artery, taken from one of the animals, or another animal of the same species, which is passed through the canula and everted over each end of the tube, one end of which is inserted into the artery of the giver, and the other into the vein of the receiver. The artery may be kept for 48 hours in an ice-house, so that in the human subject

arteries could be taken from operation patients. This method was employed on bitches and rabbits with or without previous blood-letting.

The other method consists in drawing off sufficient blood from an animal of the same species, defibrinating it and filtering through glass-wool. It is then washed and centrifugalized two or three times, and the corpuscles are injected intravenously suspended in saline solution.

Dalmas concludes that such transfusions rapidly restore animals bled to the last extreme or apparently moribund. The coagubility of the blood is distinctly increased, but the washed globules give inferior results to the transfusions of whole blood. In no case is there evidence of the destruction of corpuscles, and the blood count remains the same for days after the injection. The injections have no baneful effect on the fœtus or on the course of the pregnancy, nor have they any toxic effect on the blood, the examination for hæmolysis, agglutinins and precipitins is always negative, nor is there any evidence of anaphylaxis. Similar injections and transfusions are, he maintains, advisable in the human subject. Transfusion can be used curatively and prophylactically in cases of hæmorrhage, and the injection of globules in cases of anæmia. E. H. L. O.

Maternity Cases in the Liverpool Workhouse during 1907-8-9.

W. Alexander (*Lancet*, 1910, Vol. i, p. 1405)—One thousand three hundred and thirty cases were admitted with a maternal mortality of 0·45 per cent. F. E. T.

Puerperal Eclampsia.

Shaw (*Brit. Med. Journ.*, 1910, Vol. i, p. 1411) saw a case of eclampsia which occurred in a woman six months pregnant, previously in apparently good health. She had had almost continuous fits for eight hours. The urine was loaded with albumen. ʒii of liquid extract of ergot was administered hypodermically and two hours later the cervix was dilated by Hegar's dilators, version was performed and the child extracted. Morphia was also given. There was one fit after delivery and the patient recovered. F. E. T.

The Effects of the Poison of Eclampsia on the Children.

Feuchtwanger (*Muenchener m. Wchns.*, 1910, No. 20, S. 1098), in an address to the Munich Medical Society, discussed the effect of the specific poison of eclampsia upon the children. That there is such a poison he considers proved by the occurrence of eclampsia without nephritis; that the poison affects the children, by children being sometimes born in an eclamptic condition, and by the infantile mortality being diminished by the adoption of active treatment. The rate of mortality of the infants born by eclamptic mothers is very high and that high rate may be entirely, or to a great extent, due to the specific poison of the disease. It is therefore a question of interest and importance what becomes of the children of eclamptic mothers which are apparently healthy at birth?

On this question there is little published as yet, though other accidents of labour, forceps, impression, and asphyxia in particular, are known to be important factors in the anamneses of feebleminded children. The reason of this may lie in the specialistic development of medicine which has very properly led to eclamptic cases being treated in Hospital, and, consequently, later enquiry is difficult and the consequences are obscured. Moreover comparatively few children are borne alive by eclamptic mothers. Even on the supposition that such children had a quintuple chance of becoming feebleminded, which as the author endeavours to explain is not improbable, there would only be in 300 feebleminded children, one born of an eclamptic mother. Also even because of the maternal mortality alone, the taking the anamneses in eclamptic cases is much more difficult than the comparatively easy discovery of lues, alcoholism, or tuberculosis, in the parents.

He gave details of two cases which he had had under his observation from birth. One was the first and only child of a man aged 57 and a woman aged 42; delivered by forceps it immediately cried out, always had good health, but at school exhibited decided signs of mental inferiority. The other child, whose father was 24 and mother 18 years of age, was delivered by forceps and throve well, but in his fourth year had well marked epileptic fits of unconsciousness. Two children born subsequently were perfectly healthy. In both of these two cases lues and alcoholism were out of the question. Even if in the former the advanced age of the parents may have been a contributing factor, in the latter there is a total lack of contributory factors.

Feuchtwanger draws no definite conclusions, merely stating facts, but urges that in future in cases of eclampsia the ultimate fate of the children should be kept in view. This can best be done by the family physician who has most opportunity of surveying the general family history and may perhaps trace connecting factors of other kinds which at present are not sufficiently recognised. J. J. M.

Sudden Deafness During Eclampsia.

M. Yearsley (*Lancet*, 1910, Vol. i, p. 568).—A iii-para, aged 40, when seven months pregnant had a good many fits stretching over some hours and was comatose. An intravenous infusion of eight pints of saline solution was given and chloroform was administered. Two days later, the patient meanwhile remaining unconscious and having several convulsions, natural delivery of a still-born child occurred. There were no more fits. The urine, at first almost solid with albumen, gradually improved. Deafness in the right ear came on suddenly during the eclampsia and remained.

Yearsley points out that deafness occurring during eclampsia may be due to toxæmia, to effusion or hæmorrhage into the cochlea, or to thrombosis or embolism. Deafness due to toxæmia is invariably bilateral. The present case was probably one of blocking of the cochlear branch of the auditory artery, since hæmorrhage or effusion into the cochlea would have been accompanied by vestibular disturbances which appear to have been absent. F. E. T.

Jaundice During Pregnancy.

G. F. England and F. R. Thornton (*Lancet*, 1910, Vol. i, p. 160).—A woman, aged 28, when 6 months advanced in her second pregnancy was suddenly seized with severe abdominal pain with vomiting. A series of fits, simulating uræmic convulsions followed. The urine contained blood and albumen in large quantities. A diagnosis of eclampsia with acute nephritis was made. A vaginal douche was given and the vagina was plugged to induce labour. As soon as daylight appeared a marked icteric tinge was noted on the body and face. The conjunctivæ were œdematous and oozing a serous fluid which yielded a display of colours with nitric acid. The patient was delivered of a still-born child weighing 2¾ lbs. The placenta and membranes were bile stained. The patient became steadily worse and died the same night.

To explain the jaundice, acute yellow atrophy of the liver and phosphorous poisoning were considered. Post mortem, the liver was large and showed only small areas of hæmorrhage and necrosis. The spleen was much congested and the kidneys showed early tubal nephritis.

The writers consider that this case goes to establish the following dictum of Ellice Macdonald: Under the clinical titles, hyperemesis gravidarum, eclampsia, and acute yellow atrophy of the liver we have found enough to warrant a definite statement that they are one and the same disease. F. E. T.

Jaundice and Pregnancy.

Kühn (*Der Frauenarzt*, 1909, Pt. 10) publishes a report of a case where this complication existed, believing that the treatment and its result supported the now prevalent teaching that it is the jaundice that must be cured, even by operation if

necessary, whilst on the other hand the induction of artificial labour is unjustifiable. A woman, aged 31, pregnant and deeply jaundiced, was admitted into Rissmann's ward in the Midwives' Institute at Osuabrück. She had borne two children, the last labour took place nine months before she came under treatment. About seven years before admission she had an attack of what the after-history proved to be gall-stone colic, the symptoms recurred about twice yearly. At the end of six years an attack occurred which was followed by jaundice. Under treatment in hospital for many months the jaundice diminished but never disappeared completely. The patient saw her last period six months before admission; during that space of time the attacks of biliary colic became very frequent, latterly they came on about once a week. At length the patient underwent medication by the "oil-cure," and her doctor declared that he could detect calculous gravel in the motions, but she felt certain that solid sand-like material had passed from the bowel ever since the first appearance of the icterus. She ultimately sought admission into the Institute. Kühn describes her as deeply jaundiced and very cachectic so that cancer of, or in the region of, the bile ducts was suspected; acute atrophy was contra-indicated as the symptoms had long preceded the pregnancy. The urine was deeply coloured, but not albuminous, the fæces were colourless. There was no evidence of any disease of the heart, lungs, or kidneys. The fundus uteri reached to within two fingers' breadth of the umbilicus. Rissmann laid open the duodenum and extracted a calculus of the bulk and shape of an acorn which had become impacted in the orifice of the common duct. It bore no facets. At the end of three weeks the patient left hospital, her general condition was greatly improved, the jaundice had diminished, but the fæces did not become coloured until a fortnight later. The jaundice then disappeared completely and the patient was in robust health when she returned to the Institute for her confinement. She was delivered spontaneously at term of a child over twenty inches in length, the circumference of its head was thirteen and a quarter inches and its weight seven and three-quarter pounds. It was free from jaundice, no bile pigments could be found in the liquor amnii, but the membranes were slightly stained. The puerperium was uncomplicated and the patient suckled her child, and it was of normal weight and size when last seen.

Kühn observes that induction of labour would not have cured the jaundice, whilst the operation was followed by complete cure. The experience of Potocki led him to the same conclusion and Kühn quotes other writers who have observed the relation of icterus to pregnancy and maintain that the former should be cured whilst the latter should not be interrupted. A. D.

Bile-Cyst of Liver and Ovarian Cyst.

Queisner (*Monatsch. f. Geb. u. Gyn.*, May 1910), at a recent meeting of the Nordostdeutsche Gesellschaft für Gynäkologie, exhibited a patient in whom these two conditions, one very rare, the other common, co-existed. She was 23 years of age, and had borne two children. Three months before she came under his care symptoms leading to a diagnosis of perityphlitis developed. Queisner was able to define a fluctuating tumour, of the size of a man's head, in the right hypochrondrium. It had no connection with the uterus, and, on the other hand, there was a clear note on percussion for the space of a hand's breadth between the liver, above, and the tumour. At first hydronephrosis was suspected, but the cystoscope was used, and both ureters were found to function properly. A mass, of the size of a man's fist, evidently an ovarian tumour, occupied the left side of the abdomen. This tumour was removed without difficulty. Then it was found that the large tumour projected freely from the under surface of the liver. Its wall was friable and did not allow of enucleation; it was therefore fixed to the abdominal wound. The patient made an uninterrupted recovery. On microscopic examination of the contents it was found to be a retention cyst.

[This case resembles another published seven years ago by the reporter, "Large Bile-Cyst of the Liver: Jaundice without Cholelithiasis: Incision and Drainage: Recovery," *Med.-Chir. Trans.*, 1904, Vol. lxxxvii, p. 1. The development of the disease was traced to an accident three years before admission; the patient, when pregnant, fell against the edge of a washing-tub, striking the right hypochondrium, and aborted a few hours later. The cyst contained over three pints of deep green bile, and no calculi were found. Since the monograph was published the patient has borne two more childen, and was free from jaundice during both pregnancies. It is to be regretted that Queisner did not make any note about the date of the pregnancies in his patient and the presence or absence of complications. Potocki has shown how biliary stasis, common in pregnancy, allows the *bacillus coli* to ascend the biliary ducts, hence the frequency of cholelithiasis in pregnancy. Biliary stasis would explain the rupture of a bile duct in the substance of the liver in the reporter's case, and the consequent development of a bile cyst. Queisner's case may very possibly be explained in the same way, his patient receiving a blow during pregnancy, or an engorged duct might have yielded by pressure from within.—*Rep.*] A. D.

Twin Pregnancy with Hydatidiform Mole.

Hergott (*Ann. de Gyn. et d'Obstét.*, June 1910) gives an account of a twin pregnancy in which one placenta showed hydatidiform changes while the other was healthy.

The patient was 33 years of age and had had seven previous full term confinements. When four and a half months pregnant she was seen on account of ante-partum hæmorrhage; it was then noticed that the uterus was larger than usual, being 4 centimetres above the umbilicus. Ballottement was absent and no fœtal parts could be made out. She was kept in bed for 2 days and the hæmorrhage ceased. Five days later, however, she was re-admitted with free ante-partum hæmorrhage caused by a low insertion of the degenerate placenta. When rupturing the membranes a portion of the placenta came away and shortly after a mass of hydatidiform vesicles weighing 400 grammes was spontaneously expelled.

No trace of a fœtus was seen. The second ovum was soon born; the placenta was entirely separate from the first one and was formed of normal placental tissue. The fœtus weighed 300 grammes. The temperature rose on the third day of the puerperium and in spite of most energetic intra-uterine lavage the patient died on the 15th day.

An autopsy showed extreme jaundice with softening and enlargement of the liver and spleen. Pelvic appendages normal. C. W.

United Twins.

Riggall (*Brit. Med. Journ.*, 1910, Vol. i, p. 1050) records and figures a case of united twins from the island of Samar, one of the Philippine group. Two otherwise complete bodies are attached by an external bond, which consists of a union of the right and left buttocks respectively, and they possess a common rectum and anus. The twins are 22 months old and quite healthy.

Carmichael (*Brit. Med. Journ.*, 1910, Vol. i, p. 1352) sends a photograph of united female twins which possessed a common cloaca, i.e., a common anus and vulva. The twins are no longer living. F. E. T.

Triplets.

G. Aldridge (*Lancet*, 1910, Vol. i, p. 1619) delivered a primipara, aged 28, of triplets, two being mummified male fœtuses of four and six months development respectively and one a living female child of 8½ months. There were two placentæ, the male fœtuses being attached to one placenta and the female child to a separate one. F. E. T.

The Uses of de Ribe's Bag as a Vaginal Dilator in Obstetrics.

Sauvage (*Ann. de Gyn. et d'Obstét.*, May 1910) points out that de Ribe's bag, although frequently used as a cervical dilator, is usually emptied and withdrawn as soon as it is expelled from the uterus into the vagina, but he finds that the bag may be usefully employed to dilate the vagina, especially where rigid soft parts are likely to cause delay. The most common condition in which it may be thus used is a breech presentation occurring in a primigravida. He has made use of de Ribe's bag in this way from time to time since 1899, but since 1908 every primigravida with any breech presentation has had a bag put in the vagina.

If the cervix is dilated and there are signs of fœtal distress the bag is introduced and filled under anæsthesia. It is then extracted, and subsequent manipulations for the delivery of the child are facilitated by the relaxed condition of the soft parts. Care must be taken that lacerations are not caused by too rapid extraction of the bag. If the condition of the fœtus is good the usual practice is to wait till the cervix is two inches in diameter, and then, without anæsthesia, to introduce a bag of 450 cc. capacity. The bag is slowly filled and is left *in situ* till expelled by nature.

The bag should be inserted before the breech begins to fill the pelvic cavity, but the cervix must be about two inches in diameter, otherwise it may not be fully dilated when the bag is expelled. Sauvage states that, on the whole, labour is accelerated by the presence of the bag in the vagina, but if it is expelled before full dilatation of the cervix there may be delay owing apparently to an inhibition of the cervix after delivery of the bag. The child usually rapidly follows the bag; if interference is necessary it is easy owing to the relaxed condition of the parts. Statistics from the *Clinique Baudelocque* show a fall in the fœtal mortality from 13·75 per cent. to 10·25 per cent. since the bag has been used on every primigravida admitted with a breech presentation. The result to the mothers is satisfactory. The disadvantages are—(1) the pain caused by filling the bag; (2) the tendency for the breech to descend into the dilated vagina, while the head may be retained above an undilated cervix. C. W.

The Treatment of Labour in Contracted Pelvis, with Special Reference to the Justifiability of Pubiotomy.

G. F. Blacker (*Lancet*, 1910, Vol. i, p. 778) divides contracted pelves into four classes and assumes that in any given case the child is of normal size.

Class 1 contains all cases with a true conjugate of $2^2/_5$ in. or less. These necessitate abdominal section, either the classical Cæsarean section or one of its modifications.

Class 2 comprises pelves with a diameter of from $2^2/_5$ to 3 in. The ideal treatment here is Cæsarean section before or during labour, provided that the condition of the mother and child is good and no attempts at delivery have been made. When unsuitable for this or there are signs of septic infection, and forceps and version have failed, the child should be delivered by craniotomy or embryotomy.

Class 3, with a conjugate vera of from 3 to $3^3/_5$ in. Cæsarean section is indicated.

Class 4 with a conjugate of more than $3^3/_5$ in. Where Cæsarean section is inadvisable or refused, and induction has been followed by the birth of a still-born child, the patient may be allowed to go to term, and pubiotomy may then be performed if necessary. If the patient is in labour, the head is arrested at the brim, and moderate traction with high forceps fails, Cæsarean section should be performed (instead of forcible delivery with high forceps or of version). If unsuitable for Cæsarean section, pubiotomy may be substituted for craniotomy of the living child. Pubiotomy should only be done where the child's life has not been imperilled and only in such surroundings as obtain in a hospital. It is not an operation suitable for private practice. F. E. T.

Spontaneous Version During Labour.

Rouvier, Algiers (*L'Obstétrique*, June 1910), records a case of this phenomenon. The patient was a quartipara : of her five previous deliveries at term two children were born footling, and one still-born had presented by the shoulder. On admission to the hospital examination revealed nothing abnormal about the pelvis, but Professor Rouvier found the uterine walls flabby and the fœtal head movable above the brim and tending to pass into the right iliac fossa, so he warned the resident staff to look out for a shoulder presentation. The child however was born footling. Rouvier explains the version by the flabbiness of the uterine wall, especially on one side. E. H. L. O.

Rupture of the Uterus Healed by Suture of the Rent per Vaginam and Drainage.

H. J. Paterson (*Lancet*, 1910, Vol. i, p. 497).—A multipara, aged 25, started in labour on August 11, 1909. She was first seen by her doctor on August 13. The cervix was then slightly dilated, there were no labour pains and the cord was prolapsed and pulseless. On August 14, labour pains returned but there was only slight dilatation of the os. The cervix was manually dilated under chloroform until the hand could be passed through the os. The right foot was seized and brought down and delivery was effected. No instruments were used. The placenta was expressed with ease. On introducing the hand into the vagina it passed into the abdominal cavity. The patient was then sent to hospital.

On admission there was some bleeding from the vagina, the patient was collapsed and the pulse uncountable. Under ether, large intestine was found prolapsing through a rent in the posterior vaginal wall. This was replaced and a considerable quantity of blood was removed from the pouch of Douglas. The cervix was then found to be torn completely through the tear extending upwards and involving the uterus for a distance of at least four inches. The rent was sutured with catgut stitches, and the pouch of Douglas was drained by a large rubber tube. The patient recovered.

Paterson considers that a perusal of the recorded cases leads one to believe that in some instances recovery ensued not because of, but in spite of hysterectomy. In this case the patient was not in a condition to stand hysterectomy, which would probably have had a fatal result. F. E. T.

Collargol Injections as a Cause of Hæmorrhage.

Potochi (*Ann. de Gyn. et d'Obstét.*, May 1910) records a case where a considerable hæmorrhage followed an intravenous injection of collargol. He quotes from other recorded cases, and asks whether the collargol injections can cause the hæmorrhages.

His patient was aged 21 years; there was a history of tuberculosis and albuminuria. Normal delivery was rapidly followed by fever, and 24 hours after delivery an intrauterine douche was given; the vulva was then apparently normal. Fifty hours after delivery 15 centigrammes of collargol dissolved in 15 cc. of freshly boiled distilled water, were injected into the veins of the forearm.

Five hours after the collargol had been used the patient had intense pain in the vulva, and vaginal examination disclosed a hæmatoma, as big as a pigeon's egg, in the right wall of the vagina which grew as large as a fœtal head in two hours. It subsequently suppurated and was drained. The patient died on the sixth day after delivery. Post mortem, signs of tuberculosis and sapræmia. Potochi points out that the hæmorrhage came on late if it was due to trauma during delivery, and its very rapid formation soon after the collargol injection is suggestive. C. W.

On the Treatment of Puerperal Fever.

C. SCHMIDLECHNER (*Wiener klinisch-therapeutische Wchns.*, 1910, No. 2–3) reviews the material of the Pest Klinik on the principles adopted at the Strassburg Congress of the German Gynæcological Society. The number of women delivered was 5,128; puerperal diseases affected 2·88 per cent., and were fatal in 0·11 per cent.; clinical infection occurred in 1·67 per cent., with a mortality of 0·057. The morbidity of operative labours was 13 per cent., that of spontaneous only 0·27 (48 : 1); their mortality was 0·86 and 0·06 respectively. The conduct of labour therefore should be as conservative as possible. Cautious local treatment is beneficial in fever from absorption, in endometritis and in puerperal ulcers, the fever, as a rule, disappearing within three days. The danger of infection is greatest when portions of the placenta are retained, though these are occasionally expelled spontaneously under ergotin. When they decay, digital evacuation is the best treatment. Local treatment is useless when the infection has extended into the deeper tissues, and is injurious when there is any inflammatory reaction in the neighbourhood of the uterus; but even in such cases it may be necessary to remove retained portions of the placenta to arrest profuse hæmorrhages. Local treatment has a certain prophylactic value, and when correctly carried out can only be injurious in exceptional cases. J. J. M.

Infective Endocarditis During Pregnancy.

E. E. NORTON (*Lancet*, 1910, Vol. i, p. 162) records two cases of the fulminating form of infective endocarditis occurring during pregnancy. They both occurred in young women; each of the patients was the subject of an unwelcome pregnancy, and each had confessedly made attempts to procure abortion. In each case there was a sudden attack of severe illness, miscarriage occurred and death followed upon a profound toxæmia. The symptoms bore the strongest resemblance to those which might have been produced by septic conditions following upon abortion criminally procured by the use of instruments.

The diagnosis was made in one case and confirmed in the other by post mortem examination. Bacteriological investigations were not pursued. F. E. T.

Transfusion as a Cure for Melæna Neonatorum.

HERMANN O. MOSENTHAL (*Journ. Amer. Med. Assoc.*, 1910, Vol. liv, p. 1613).—The case is the third one of its kind to be reported. As in the previous case, the result was entirely successful. The father's radial artery was anastomosed to the baby's femoral vein.. After the transfusion the child changed from a waxy pallor to normal, and except for one additional bloody stool, which evidently was contained within the intestine at the time of the transfusion, there was no further hæmorrhage, and the child subsequently did well. C. N. L.

Congenital Pulmonary Tuberculosis.

DELMAS, Montpellier (*L'Obstétrique*, May 1910) relates the case of a child delivered with forceps and instantly put into a sterilized incubator where it was fed on sterilized milk. The mother was moribund from phthisis at her confinement, and the child died in its fourth month with well-marked tuberculosis of the lungs which were, so to speak, full of tubercle bacilli. These had evidently gained access by the blood, as there were no intestinal lesions. Delmas concludes that this case must be added to the few rare records of congenital tuberculosis. E. H. L. O.

REPORTS OF SOCIETIES.

ROYAL ACADEMY OF MEDICINE IN IRELAND.

Section of Obstetrics.

Meeting held Friday, April 1, 1910, Gibbon FitzGibbon (President) in the Chair.

Communication from Committee of Reference (case described on pp. 145 and 146 of February Number of "Journal").

"We have examined the specimen described by Dr. Rowlette in the accompanying manuscript, and are of opinion that the case is one of ruptured ovarian gestation. The possibility of its having been tubal or tubo-ovarian is excluded by the fact that the tube was found to be normal and separate from the ovary at the operation. From the close relation of the fœtal structures to the lutein cells, it appears probable that the impregnation took place in a Graafian follicle, from which the corpus luteum subsequently developed.—H. C. Earl, A. C. O'Sullivan, H. Jellett."

The President exhibited specimens of (a) Sarcoma of Body of Uterus, (b) Carcinoma of Body of Uterus, by way of contrast. The patient in the first case was a girl, aged twenty. Her symptoms were frequent and heavy menstruation, and a considerable amount of leucorrhœa almost entirely of pure pus. Examination showed the uterus to be considerably enlarged and very nodular. He passed a Bozeman's catheter and washed away a considerable amount of pus situated at the upper part of the uterus. The diagnosis was myomata, but he thought it might passibly be a case of sarcoma. As against the myomata was the age of the girl. The operation presented no particular features. He did a supravaginal hysterectomy, leaving a portion of the cervix. There was a tumour in the right broad ligament lying between the hilum of the ovary and the uterus. After removal the condition of the endometrium as shown in the specimen was plainly seen. There was enormous proliferation of mucous membrane all over the upper surface, and on the posterior wall a nodule almost like a myoma which had lost its blood supply. On examination it was proved to be sarcomatous. The uterine wall was extraordinarily thick. At first sight the specimen gave one the impression of recent parturition. A section through the uterine wall showed nothing but muscular tissue, and he did not know how to explain the thickening. The patient made an excellent recovery. He had not removed the remainder of the cervix as the malignant growth was entirely separated from it by an inch and a half of tissue.

The second specimen was from a woman, aged about fifty-five or sixty years. She had gone into hospital complaining of profuse discharge. He found a large uterus, also nodular. He washed out the uterus and found great retention of pus. On scraping with a blunt curette he brought away a lot of sloughing growth. The scrapings were carcinomatous. On opening the abdomen he found the uterus comparatively free. There was very little extension of the growth in the neighbourhood of the cervix, and the fundus was entirely free. But on the left side there was a growth extending up into the pelvic glands behind the peritoneum. This he thought he was able to extirpate. On the other side there was a similar extension. The

glands all along the aorta were enlarged. He removed them to the level of the second lumbar vertebra. He removed the uterus and a good deal of the vagina. The uterus lay low in the pelvis, and when he cut across the vagina he was within an inch of the vulva. The condition of the patient after the operation was fairly satisfactory, and he thought he would try to take away another gland higher up. He split the peritoneum further along the ureter, and found the remaining gland firmly adherent to the lower vena cava. The patient gradually got weaker, and died in a couple of days. The case was one of long standing, and he thought her heart muscle was weak. There were no obvious symptoms ot sepsis.

Dr. Purefoy said the case of sarcoma was, in his experience, quite without parallel. He would watch for the subsequent history of the case, as he himself had had a patient aged sixty-five who died of secondary disease in the left lung a few months after he had removed a large fibrous uterus, which for thirty years had only caused inconvenience by its size. He did not remove the cervix. With regard to the second case, it was admitted that a proportion of the enlarged and hardened glands, the appearance of which suggested malignant disease, did not really contain it. Nevertheless, any of them who had such a case would, no doubt, endeavour to remove the glands as completely as possible. In the case of an aged patient, they had to consider whether they were warranted in carrying out a prolonged operation for the complete removal of all the enlarged glands they could feel.

The President remarked that Sir William Sinclair, on his recent visit, had said to him that he was in the habit of telling his class that cancer of the body of the uterus only occurred in comparatively well to do, and cancer of the cervix in very poor, patients. Sir William's idea was that the only way to prevent cancer of the cervix was by improving the conditions under which the patients lived. In his (the speaker's) experience the rule did not apply in Ireland.

Dr. Holmes said that, looking back on the cases in the Rotunda, the number in the extern dispensary of cervical cancer seemed to him to be more numerous than the house cases. Neglect of discharges might set up disease, but the upper classes, if anything went wrong, generally had the matter seen to.

Dr. Purefoy said his experience did not correspond with Sir William Sinclair's. He would like to know if, from inspection of the sections, it was possible to determine whether the sarcoma had occurred in the connective tissue or muscular cells.

The President said that there was a doubt in the mind of Prof. O'Sullivan, who reported on the specimen as to its origin in the ovary. Prof. O'Sullivan's report is as follows :—

"The uterus was large, the body being four inches in length and the wall a little over an inch thick at the thickest part. The upper two-thirds of the cavity was filled by an irregular growth, with numerous polypoid excrescences projecting into the lumen. The surface of the growth was acutely inflamed and partially necrosed, and covered in places with a thick layer of pus, which contained a variety of organisms, bacilli and cocci. The growth could be seen to infiltrate the posterior wall of the uterus, and secondary nodules could be felt in the upper and posterior part of the wall. The ligament of the ovary was also infiltrated, and the ovary inself was converted into a mass, partly nodular and partly cystic. Under the microscope the tumour showed a very cellular structure, spindle and large round cells with numerous nuclear figures. The solid tumours in the ovary had a similar structure. A large nodule lay in the upper uterine wall, which was of a dull grey colour on section, and proved to be of similar structure."

Dr. FitzGibbon exhibited a specimen of Suppurating Ovarian Cyst with Tubercular Pyosalpinx. B. N., aged nineteen, had four years ago tubercular disease of a finger, which was amputated. Her menses, which had always been regular from the time they commenced, ceased in November, 1909, and shortly after that she developed

a cough, and had several attacks of vomiting accompanied by pain in the abdomen. She was admitted to Mercer's Hospital on January 3, 1910, and the speaker first saw her about the end of January. She then had an irregular temperature, varying between 99° and 101°, and pulse from 95 to 110. She had ceased to vomit, but complained of acute pain in the abdomen, and was very constipated. A tumour could be felt extending to one and a half inches from the umbilicus. On vaginal examination the pelvis was found to be filled up by a cystic tumour, which was fixed, and which pushed the uterus upwards and forwards. The left appendages could be felt apparently normal, but the tumour prevented any examination of the right side of the pelvis. The patient was kept in bed and the bowels freely acted upon, and then the temperature improved, but the pain continued to be severe. On March 1st the abdomen was opened, and an ovarian cyst found springing from the right side and firmly adherent all over the back of the pelvis. The intestines were completely shut off by the omentum. In freeing the cyst from the pelvis it ruptured, and discharged about two pints of purulent contents. The left tube was greatly thickened and adherent, also containing pus. By working down the left side of the uterus, and then dividing through the vagina the right appendages were shelled out. The left tube, which was removed, was perfectly normal, and the left ovary retained in situ, as it seemed quite healthy. The pelvis was drained through the vagina with iodoform gauze passed from above down, and only iodine catgut used throughout. Cultures were made from the pus in the tube immediately after the operation with a view to making an autogenous vaccine if the case developed into one of acute sepsis, as was anticipated from the amount of pus which unavoidably got about the pelvis; also saline enemata, two pints, were given every two hours for two days. The temperature rose after the operation to 102°–103°, and the pulse to 130 to 140, and remained fairly steady for the first four days, when they began to improve, and have since remained from 99° to 101° and 100 to 120. The lower inch of the abdominal wound opened and discharged a foul-smelling pus for about ten days, and is now granulating, while the pus from the vagina went through the same stages. The patient looks better, is free from pain, but the high temperature and pulse continue. The report received on the specimen was that the cultures contained no pyogenic organism, and except a bacillus which resembled B. coli the pus did not show any other pyogenic organisms. Sections made from the wall of the ovarian cyst proved to be tubercular, while the left tube was normal. The ovarian tumour showed a large single cavity, strongly suggestive of an abscess, and in no way resembling an ovarian cystoma.

Dr. Purefoy said he understood there was no evidence of gross uterine disease, and the removal of the uterus did not commend itself to him as the best proceeding under the circumstance. It increased the area in which infection might take place, and it was a serious loss to a patient at the age of the case. He thought an adequate opening might have been found in Douglas's space.

Dr. Rowlette said the association of tuberculosis and cystic growth in the same ovary was, he thought, very rare, though one saw frequently tuberculosis of the tube associated with a certain kind of cystic growth of the ovary. It was indeed rare for any tumour to become infected by tuberculosis. He thought the cyst was really an abscess cavity.

With regard to the President's specimen, it seemed to him to be an advanced case of sarcoma starting in the endometrium. He should say the nodule was sarcoma from the beginning. The fact that the uterus was so large showed, he thought, a good deal of resistance on the part of the patient, and that the growth was not very rapid. The fibrosis must have been a reaction to the growth of the tumour, which would be encapsuled to a certain extent.

The President, speaking on Dr. FitzGibbon's specimen, said he had never before heard of a specimen of tuberculosis of an ovarian cyst, and the first thing to know

was the nature of the cyst. If it was purely an abscess starting in the ovary, then the tubercular infection would not be quite so unusual. But, if it was a proliferating cyst of the ovary, he did not know that he had ever heard of such a condition being recorded before, and he thought Dr. FitzGibbon should be asked to give them some further information at a later date.

Dr. FitzGibbon, in reply, said the section showed typical tubercular infection, but he did not think any one could say definitely that it was from a proliferating ovarian cyst, in fact the inner surface of the section did not show anything to suggest ovarian cystoma, but strongly resembled the lining of an abscess cavity. He thought the case, now that he had obtained and seen a section of the tumour, to be one of tubercular ovarian abscess. In reply to Dr. Purefoy, he said the condition of the patient appeared so bad, and such a quantity of pus had escaped about the pelvis, that he thought the only chance was to obtain absolutely free drainage, and that this would be best by removal of the uterus, even then he hardly expected the patient to survive.

Dr. Sheill read a paper on "Our responsibilities in the treatment of inherited syphilis," and a discussion followed.

Dr. Solomons showed a specimen of a fractured skull which had been raised by means of one blade of an American bullet forceps. He said that the case occurred in a quartipara, who gave a history of her previous babies having had "dents" in their heads. Her pelvic measurements were :—interspinous, 27 cm. ; intercostal, 28½ cm. ; external conjugate, 17 cm. ; conjugata vera, $6^{1}/_{5}$ cm. ; transverse of inlet, $13^{3}/_{10}$ cm. Prolapse of the cord occurred when the membranes ruptured, and version was performed and the child delivered. When born it was found that there was a depressed fracture of the right parietal bone. This was raised as follows :—The point of a sharp bullet forceps was placed in the centre of the depression, the forceps was turned through a right angle, and then raised ; it was easily to be seen in the specimen that the cure of the fracture was complete. This method, which was first performed by Dr. Tweedy, had been carried on in the Rotunda Hospital with uniform success. In this case the infant became jaundiced soon after birth, and died on the third day. There was no paralysis. A post-mortem examination revealed nothing except the mark of the bullet forceps in the brain to the extent of possibly one-eighth of an inch, and evidently this had nothing whatever to do with the death of the child.

Dr. Neal said he had seen a deep dent in a child which was born alive, and spontaneously recovered without interference.

The President asked if it was the practice to lift all dents with bullet forceps.

Dr. Pearson said the skull of a new-born child was a very pliable structure, and might not require any treatment to elevate a fracture. From a surgical point of view the objection which he saw was the possibility of injuring a meningeal vessel.

Dr. Holmes thought any noticeable depression ought to be raised. He had used the method several times, and the children did very well.

Dr. FitzGibbon said there was a hæmatoma between the dura mater and the parietal bone, not very extensive, and he asked if the bullet forceps had punctured the dura mater.

Dr. Solomons, in reply, said all depressions of any import were raised. There was a puncture in the dura mater when the specimen was fresh.